IPART Energy Sustainability Schemes

Metered Baseline Method

Method Guide

V2.5, February 2023

ESS »

The Independent Pricing and Regulatory Tribunal

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Acknowledgment of Country

IPART acknowledges the Traditional Custodians of the lands where we work and live. We pay respect to Elders both past and present.

We recognise the unique cultural and spiritual relationship and celebrate the contributions of First Nations peoples.

Contents

1 About this document

The NSW Energy Savings Scheme (**ESS**) seeks to reduce energy consumption in NSW by creating financial incentives for organisations to invest in energy saving projects.

The other objects of the ESS are to:

- assist households and businesses to reduce energy consumption and energy costs
- make the reduction of greenhouse gas emissions achievable at a lower cost, and
- reduce the cost of, and need for, additional energy generation, transmission and distribution infrastructure.[1]

Electricity retailers and other mandatory participants (**Scheme Participants**) are obliged to meet energy saving targets. Energy savings can be achieved by installing, improving or replacing energy saving equipment. Persons that become Accredited Certificate Providers (**ACPs**) can create energy savings certificates (**ESCs**) from these activities and then sell those ESCs to Scheme Participants. The Independent Pricing and Regulatory Tribunal of NSW (**IPART**) is both the Scheme Administrator and Scheme Regulator of the ESS.[2]

This document provides guidance about how the Metered Baseline Method (**MBM**) of the ESS operates, some of the key requirements that must be met when using the method, and how to calculate energy savings for a Recognised Energy Saving Activity (**RESA**) and create ESCs. This document should be used by:

- applicants seeking accreditation as a certificate provider, to assist them in completing their application, and
- those persons who are already ACPs, to assist them in accurately calculating energy savings using this method.

This guide includes information about the following MBM sub-methods:

- Method 1 - Baseline per unit of output (clause 8.5 of the ESS Rule)
- Method 2 - Baseline unaffected by output (clause 8.6 of the ESS Rule), and
- Method 3 – Normalised baseline (clause 8.7 of the ESS Rule).

Separate guides are available for the following sub-methods:

- NABERS (clause 8.8 of the ESS Rule), and
- Aggregated metered baseline (clause 8.9 of the ESS Rule).

1.1 Legislative requirements

This document is not legal advice. The legal requirements for ACPs participating in the ESS are set out in:

- Part 9 of the *Electricity Supply Act 1995* (**Act**)
- Part 6 of the *Electricity Supply (General) Regulation 2014* (**Regulation**), and
- the *Energy Savings Scheme Rule of 2009* (**ESS Rule**).

ACPs are also required to meet any additional accreditation conditions as set out in their Accreditation Notice.

1.2 Document control

Version Number	Change Description	Date Published
V1.0	Initial release – following gazettal of ESS Rule Amendment No. 2	January 2015
V1.1	Links to Application Forms updated to reflect update to ESS website	July 2015
V2.0	Updated to reflect amendments to the ESS Rule	August 2016
V2.1	Updated to reflect amendments to the ESS Rule	May 2017
V2.2	Updated to reflect amendments to the ESS Rule	July 2018
V2.3	Updated to reflect amendments to the ESS Rule	March 2020
V2.4	Updated to reflect minor changes to processes following the introduction of The Energy Security Safeguard Application (TESSA)	September 2022
V2.5	Updated to reflect change to reflect amendments to the *Electricity Supply (General) Regulation 2014* commencing 14 October 2022	February 2023

2 Method overview

MBM is typically used for activities in industrial or commercial premises where:

- energy savings result in a significant reduction in site energy consumption that is readily identifiable through metering, and
- representative historical site energy consumption data is available.

MBM uses measurements of energy consumption before and after the implementation. The difference in energy consumption between these two periods is used to calculate the net energy savings from the RESA for each energy[a] source. Figure 2.1 below illustrates the timeline of a typical project using MBM and the different measurement periods.

The **baseline period** is the period **before** the implementation. It establishes the baseline energy consumption of the site. It is made up of one or more **measurement periods T_b**[b] (e.g. one day, one month or one year). The duration of the measurement periods T_b becomes the base time unit from which net energy savings calculations will be made.

The **implementation and commissioning period** is the time period in which the new processes or end user equipment are installed and tested.

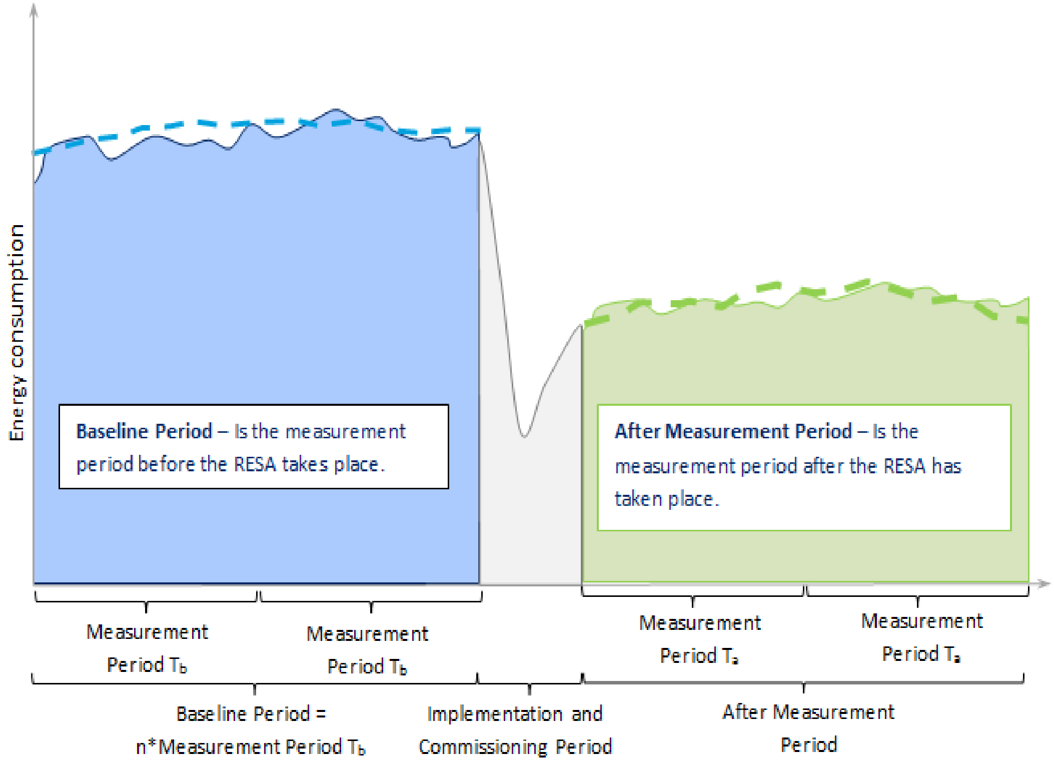
The **after measurement period** is the period **after** the implementation. It establishes the new levels of energy consumption and is the period over which net energy saving calculations will be made. The after measurement period includes as many **measurement periods**.[c] **T_a** the expected lifetime of the energy savings will allow.

[a] Throughout this document, references to 'energy' refer to electricity, or gas, or both.

[b] "T_b" – Acronym to identify the words "Time period before".

[c] "T_a" – Acronym to identify the words "Time period after".

Figure 2.1 Schematic timeline of an MBM project



When determining the length of the measurement periods T_b, you should consider that measurement periods T_a must be of the same duration.

MBM relies on the remainder of the site operating as it did before the implementation. It should not be used where changes (other than from the implementation) are anticipated during the time ESCs will be created because the results will not reasonably reflect the energy savings resulting from the implementation.

MBM applies a **confidence factor** to reduce the upfront estimated energy savings, corresponding to their certainty. This is determined based on the size of the energy savings relative to the unexplained variance in the baseline.

Energy savings can be calculated for a maximum of 10 years after the end date of the baseline measurement period. Further information about this requirement is provided in section 3.3.

3 Requirements that must be met

We have provided information below about the requirements of this method. This is not an exhaustive list of requirements, and ACPs should ensure that they are familiar with their obligations under the Act, Regulation, ESS Rule and any conditions of their accreditation.

Records that should be collected to support energy savings for each implementation are specified in **Table 7.1** (all implementations), **Table 7.2** (Method 1 – Baseline per unit of output),

Table 7.3 (Method 2 – Baseline unaffected by output), **Table 7.4** (Method 3 – Normalised Baseline) and **Table 7.5** (all implementations that include a lighting upgrade (from 31 July 2018)) of **Chapter 7 – Minimum required records**.

Evidence must be collected and retained to support the creation of ESCs from the calculated energy savings. ACPs must have the evidence at the time they apply to register ESCs. The evidence may be audited at any time.

If the RESA involves multiple implementations, or takes place at multiple sites, the required evidence must be collected and retained for each implementation.

3.1 Energy saver

An ACP can only calculate energy savings and create ESCs from an implementation if the ACP is the energy saver under the ESS Rule. The ACP must be the energy saver as at the implementation date. An energy saver can be either:

- **the original energy saver** – which, under MBM, is the person who is liable (contractually or otherwise) to pay for the energy consumption at the site at the implementation date,[3] or
- **the nominated energy saver** – which is someone the original energy saver has nominated as the energy saver by completing a nomination form.

An ACP that is the original energy saver must be accredited as an ACP prior to the implementation date in order to create ESCs from an implementation.

An ACP that is a nominated energy saver must:

- be accredited as an ACP **prior** to the implementation date and before the nomination is made,
- have a documented procedure for obtaining the nomination from the original energy saver, and
- be nominated by the original energy saver on or before the implementation date. The nomination is taken to occur on the date that the nomination form is signed by the original energy saver.

3.2 Implementation and implementation date

The ESS Rule defines implementations and implementation dates (explained below). These concepts are used to determine the number of ESCs, and from when they can be created.

3.2.1 Implementation

An implementation is the delivery of a RESA at a site. A RESA must meet all of the criteria set out in clause 5.3, 5.3A, 5.3B and 5.4 of the ESS Rule.

3.2.2 Implementation Date

For ACPs that use MBM, the implementation date is the earlier of:

- the start date of the first after measurement period,[d] or
- the date on which the reduction of energy consumption commenced due to the implementation (i.e. the date when the implementation was completed and normal operations commenced).[4]

It is not appropriate for a commissioning period to be claimed solely for the purpose of delaying the implementation date to meet the additionality requirements of clause 6.2 of the ESS Rule.

3.3 Lifespan of the baseline

Clause 8.3A of the ESS Rule limits the period over which energy savings can be calculated using MBM.

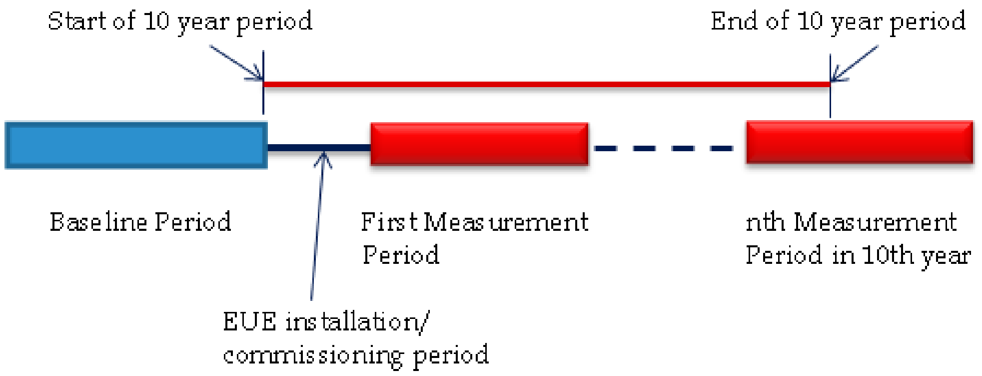
Depending on the date the ACP was (or will be) accredited, and the end date of the baseline measurement period, the ACP will generally only be able to calculate energy savings for up to a maximum of ten years. More precisely:

- where the accreditation date with respect to the RESA is on or after 15 April 2016, the ACP may only calculate energy savings for up to a maximum of 10 years from the end date of the baseline measurement period, and
- where the accreditation date with respect to the RESA is before 15 April 2016 and the end date of the baseline measurement period is less than or equal to 10 years before 15 April 2016, energy savings may only be calculated for a maximum of 10 years from the end date of the baseline measurement period.

[d] The first **after** measurement period is the first period for which an ACP intends to create ESCs.

Also note that clauses 8.5.4, 8.6.4 and 8.7.4 of the ESS Rule only allow energy savings to be calculated on the last date of the measurement period. As there is likely to be a period of time between the end of the baseline period and the commencement of the first measurement period due to equipment installation and commissioning, the 10-year limit will occur before the end of the last measurement period(s) in the tenth year as indicated in the following diagram (Figure 3.1). This means that energy savings cannot be claimed for the last measurement period(s).

Figure 3.1 Application of 10-year rule



3.4 Measurement of energy consumption

3.4.1 Defining the RESA measurement boundary

A detailed description of the site and the RESA measurement boundary must be provided. This means the ACP must:

- explain how the energy metering is done at the site
- identify the parts of the site included within the RESA boundary, and
- explain how to differentiate between what is inside and outside the RESA boundaries.

To set the boundary, the ACP must consider their ability to track future changes to the site and its operations within the RESA boundary. The ACP must be able to identify any effects of changes to the site, outside the RESA boundary, that may affect the RESA. If these 'interactive effects' are significant, the ACP must consider expanding the RESA boundary.

Electricity and gas metering must be able to discretely measure reductions in energy consumption as a result of the RESA, and may act as a de facto RESA boundary. Note that it is possible that a reduction in electricity consumption may increase gas consumption or vice versa.

Sub-metering may be used to effectively reduce the size (boundary) of the site considered for baseline calculations, thereby increasing the accuracy of the baseline and hence the 'confidence factor'. It is possible that an audit of electricity and gas metering arrangements will be required in order to confirm the RESA boundary.

3.4.2 Metering equipment

Metering equipment is important in providing reliable measurement of energy consumption data **before** and **after** the implementation of your RESA. You must use utility meters or other metering equipment acceptable to the Scheme Administrator.[5]

When applying for accreditation, applicants must describe the metering equipment on site, including:

- an outline of current processes for the testing and calibration of the metering equipment, and
- the persons responsible for these processes.

It is highly recommended that the same meters are used for the before and after measurement periods; otherwise the calculations will need to be adjusted based on the different accuracy.[e]

Meters should be calibrated as recommended by the equipment manufacturer, against relevant standards and following procedures of recognised measurement authorities.

For multi-site applications, applicants must explain how they will make sure the metering equipment at each site is acceptable, that there is a process in place for testing and calibration of the metering equipment at each site, and that the responsible persons will follow the process.

3.4.3 Fuel switching

Under the ESS Rule, an activity involving fuel switching from electricity to gas, or from gas to electricity may be used to create ESCs, provided the activity meets certain requirements. Among other things, the fuel switching activity:

- must increase the efficiency of energy consumption at the site, and
- must not increase greenhouse gas emissions.[6]

For these purposes, greenhouse gas emissions must be calculated using electricity savings, gas savings and full fuel cycle emissions factors and equations from the current version of the National Greenhouse Accounts Factors.[7]

Further information about fuel switching activities, including examples, is provided in Appendix D of this document.

3.4.4 Measuring net energy savings

The number of ESCs that can be created from a project is calculated using Equation 1 of the ESS Rule (see section 6 of this document). If an implementation reduces electricity consumption and increases gas consumption, or reduces gas consumption and increases electricity consumption, you must calculate both electricity savings and gas savings when calculating the number of ESCs to be created from a project.[8]

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[e] Chapter 8.11 of the IPMVP Volume 1 provides further guidance relating to metering equipment and issues.

In the circumstances described above, electricity and gas consumption must both be measured for the baseline measurement period and the after implementation measurement period. The electricity savings and gas savings calculated from these measurements may be positive or negative and both must be used in the calculation of the number of ESCs.

Measurements of gas must be made in accordance with the requirements set out in either:

- the *National Greenhouse and Energy Reporting (Measurement) Determination 2008* (Cth), or
- the National Measurement Institute standard for gas meters *NMI R 137 Gas Meters*.

Gaseous fuels that are eligible in the ESS are liquefied petroleum gas, and fuels listed in Schedule 1, Part 2 of the *National Greenhouse and Energy Reporting (Measurement) Determination* (Cth).[9]

3.5 Recycling requirements

ACPs are responsible for ensuring that lighting equipment removed or replaced during an implementation is disposed of appropriately. Furthermore, if the implementation:

- is in a metropolitan levy area (i.e. an area with a postcode listed in Table A25 of Schedule A to the ESS Rule), and
- has an implementation date on or after 15 May 2016,

then any lighting end-user equipment containing mercury must be recycled in accordance with the recycling requirements of a product stewardship scheme such as 'Fluorocycle' or its equivalent.[10]

3.6 Minimum requirements of conduct

The Scheme Administrator has established minimum requirements for the conduct of ACPs and their representatives (for example, employees or sub-contractors). This includes ACP responsibilities for:

- training representatives
- maintaining a register of representatives
- ensuring there is a formal, documented, signed and enforceable (legally binding) contract or agreement in place for each representative, and
- providing appropriate customer service.

ACPs are accountable for all ESS activities conducted by employees, third parties and other representatives. This includes all aspects of an activity for which they create ESCs, from the initial engagement with customers, through to the final quality assurance of documents. ACPs will be held responsible for all actions, omissions and information provided by representatives acting on their behalf under the ESS, regardless of any contract or agreement with other parties. For more information, refer to *ESS Notice 01/2013 (V3.0) Minimum requirements of conduct*.

3.7 Insurance

ACPs (and any contractors[f] involved in the delivery of the RESA) must hold and maintain public liability insurance of at least $5 million. Insurance cover of this amount must be maintained for the life of the RESA. Public liability insurance must, at a minimum, cover the replacement and/or rectification of customers' property damaged as a result of work performed by the ACP and/or the ACP's contractors.

Either the ACP or the ACP's contractors must also hold and maintain product liability insurance of at least $5 million that covers all products used in the RESA. In the event that the ACP is unable to obtain product liability insurance, the ACP must ensure that its contractors hold product liability insurance of at least $5 million.

ACPs must also:

- provide the Scheme Administrator with certificates of currency for their, and their contractors', public liability and product liability insurances, within seven days of each renewal, reissue or change of policy, and
- maintain a register of contractors that contains copies of their public liability insurance and, where required, their product liability insurance.

Compliance with these requirements will be checked at the time of audit.

3.8 Lighting equipment requirements

The following additional requirements apply where the RESA involves a lighting upgrade. Under the MBM, each item of end-user equipment used in a lighting upgrade must be either:

- a 'standard equipment class' as listed in Table A9.1 of Schedule A to the ESS Rule, or
- an 'other equipment class' as listed in Table A9.3 of Schedule A to the ESS Rule.[11]

If the ACP plans to install equipment in a lighting upgrade which is in an 'other equipment class', there are equipment requirements relating to safety that apply.[12] Equipment in an 'other equipment class' must be accepted by the Scheme Administrator as meeting these requirements before ACPs can create ESCs in respect of the use of that equipment. Further information about the equipment requirements and how to have particular equipment accepted by the Scheme Administrator is set out in the *Product Applications Guide*.

The Scheme Administrator also publishes a list of accepted products on TESSA that has been accepted by the Scheme Administrator as meeting the lighting equipment requirements.[13]

ACPs must collect records to verify that the equipment requirements have been met for each activity they implement, see section 7 of this guide. Auditors will check this information during audits.

[f] This includes any person or company the ACP is working with that is involved directly in the implementation of any aspect of the RESA.

4 MBM sub-methods

If you apply for accreditation to calculate energy savings from a project using MBM, you must include information about why the sub-method(s) you are proposing to use is/are the most appropriate for your RESA.[14] As part of the application process, for each sub-method applicants are required to provide:

- sufficient information to justify using the relevant sub-method, and
- the required evidence specified in this guide.

Each of the sub-methods is described briefly below. The decision tree provided in Figure 4.1 is designed to assist applicants to determine which of the three MBM sub-methods, or the PIAM&V method,[15] is the most appropriate method or sub-method for their proposed RESA. ACPs and applicants should refer to the relevant Appendix and the ESS Rule for further information about the sub-method applicable to their project.

Applications for accreditation to use more than one of the three sub-methods included in this method guide (e.g. for a multiple future implementations) must also include information about how the most appropriate sub-method would be selected for each implementation. More details can be found in the *Application Form – Part B*.

4.1 Method 1 – baseline per unit of output

The MBM baseline per unit of output sub-method (Method 1) should be used to calculate energy savings where energy consumption is strongly linked to output from a site (e.g. electricity consumption from aluminium smelting).

Further information about Method 1 is provided in Appendix A - Method 1 – Baseline per unit of output.

4.2 Method 2 – baseline unaffected by output

The MBM baseline unaffected by output sub-method (Method 2) should be used to calculate energy savings where consumption is not linked to output from a site. For example, when a

RESA is implemented at a production site for which the energy consumption remains similar regardless of whether 1 or 1,000 units are produced.

This method may also be used at sites where a service is provided (e.g. in schools, hospitals, retail stores and hotels) and the amount of energy used remains reasonably constant regardless of the number of people using the service.

Further information about Method 2 is provided in Appendix B - Method 2 – Baseline unaffected by output.

4.3 Method 3 – normalised baseline

The MBM normalised baseline sub-method (Method 3) should be used where an explainable variation to energy consumption at the site can be removed through normalisation against some other factor(s). That is, variations to your energy baseline can be removed to create a normalised baseline.

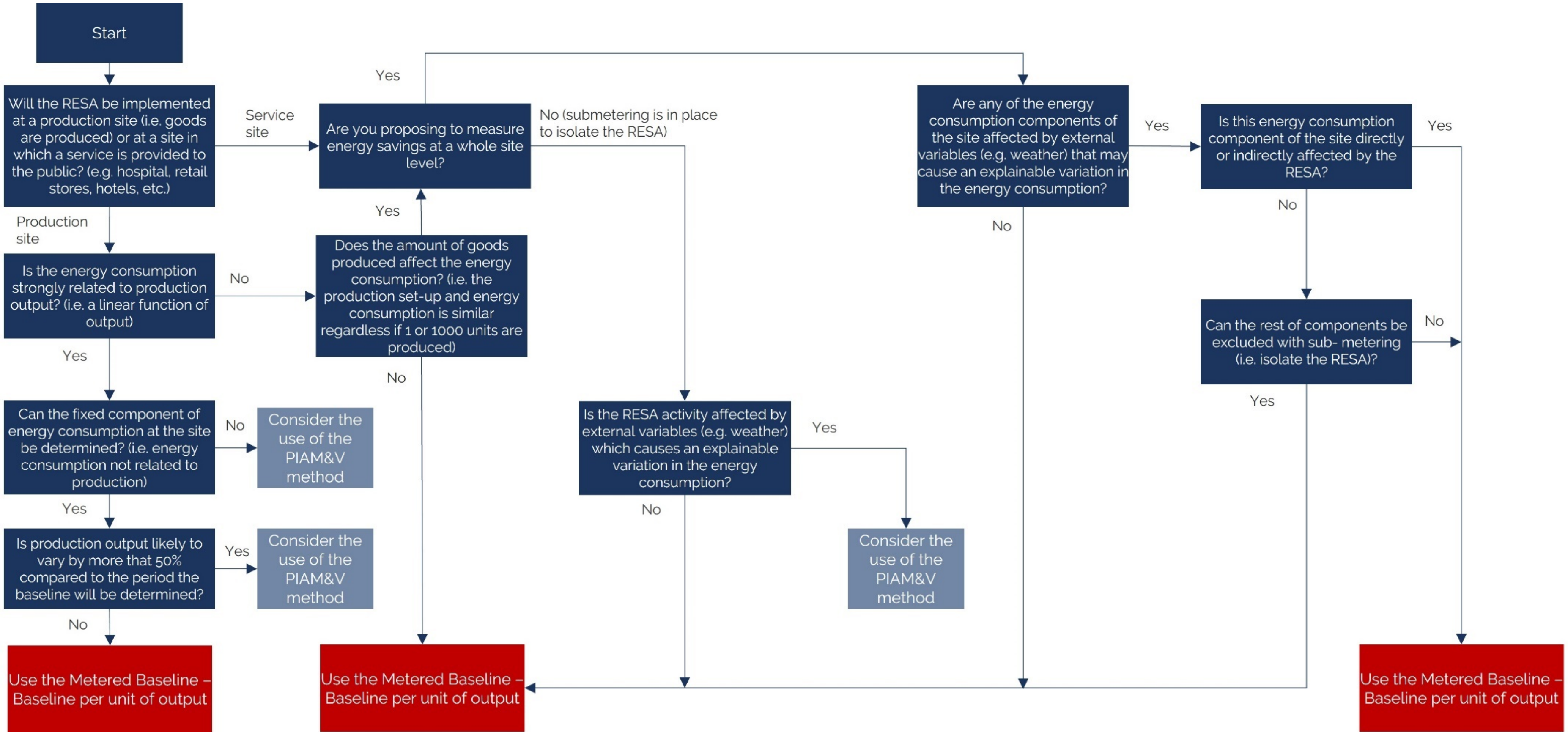
Variables used to normalise the energy consumption must correspond to specific activities or situations that cause the change in the total electricity energy consumption. For example:

- variations in ambient conditions (i.e. energy consumption is strongly related to outside temperature and therefore the consumption will change from one period to another), or
- variations in production processes or production inputs at certain times of the year (i.e. where seasonal produce varies and takes more energy to process, or where part of the plant is shut down for the same period every year).

The ACP should be able to justify that the factors are a cause of the variation in the baseline(s) and not the result of spurious correlation. For example, reduced production could be caused by a reduction in sales and this in turn would result in less energy consumed. This is not considered relevant when determining a normalisation factor.

Further information about Method 3 is provided in Appendix C - Method 3 – Normalised Baseline.

Figure 4.1 Decision tree for selecting an appropriate MBM sub-method



5 Calculating energy savings

Each of the MBM sub-methods provides specific steps for calculating energy savings. Detailed information about how to calculate energy savings using each of the sub-methods included in this guide is provided in Appendices A, B and C. Under the ESS Rule, energy savings comprise both electricity savings and gas savings.

Applicants and ACPs should refer to the ESS Rule and the Appendix of this guide applicable to their selected sub-method to:

- understand how the energy savings calculations must be performed
- develop the calculation spreadsheet[g] required to be submitted with an application and used to calculate energy savings on an ongoing basis, and
- identify the evidence you must collect when implementing this method.

[g] When developing a calculation spreadsheet, all formulae should be clearly identified and referenced.

6 Calculating and creating ESCs

Once energy savings have been calculated for an implementation using the relevant sub-method, Equation 1 of the ESS Rule is used to calculate the number of ESCs that may be created from the energy savings calculated in relation to an implementation.[16]

Note that ESCs can only be created where Equation 1 has a result that is greater than zero.

Equation 1

$$\text{Number of Certificates} = \Sigma_{\text{Implementations}} (\text{Electricity Savings} \times \text{Electricity Certificate Conversion Factor} + \text{Gas Savings} \times \text{Gas Certificate Conversion Factor})$$

6.1 Applying to register ESCs

Certain information must be submitted to the Scheme Administrator by an ACP to apply to register ESCs.[17] ACPs must provide the required information by uploading the Implementation Data in a csv file format on our online system, TESSA.

6.1.1 Implementation data

The Implementation Data must include a calculation of the number of ESCs to be created in accordance with Equation 1 in the ESS Rule. This calculation involves:

- multiplying the electricity savings from the implementation or implementations by the electricity certificate conversion factor[18]
- multiplying the gas savings from the implementation or implementations by the gas certificate conversion factor,[19] and
- adding the two figures together.

The result is the total number of ESCs that ACPs can apply to register from the implementation or implementations. If the result is not a whole number, it is rounded down to the nearest whole number.

More information about the implementation data that needs to be provided for the MBM is set out in the *CSV Specification* guide.

6.1.2 Submitting your Implementation Data

Implementation data must be saved in the csv file format. This must be completed before uploading to TESSA at the time of registering certificates.

Implementations can be bundled together in an Implementation Data upload. However:

- ACPs must apply to register all ESCs included in an implementation data upload in a single application
- ACPs cannot split energy savings calculated from a single implementation across two or more implementation data uploads, and
- each implementation data upload must only include the calculation of energy savings that are taken to have occurred in the same calendar year (commonly referred to as 'vintage').

When determining how many implementations to bundle in the same implementation data upload, ACPs should consider:

- the ESC creation limit specified in their Accreditation Notice, as they must be able to register all the ESCs in the bundle at the same time, and
- the cost of registering certificates.

More information on registering certificates can be found on the ESS website.

7 Minimum required records

ACPs are required to keep records in respect of a RESA, including records of:

- the location in which the RESA occurred
- the energy savings arising from that RESA
- the methodology, data and assumptions used to calculate those energy savings, and
- any other records specified in writing by the Scheme Administrator.[20]

ACPs must retain records for at least six years, in a form and manner approved by the Scheme Administrator.[21] Each ACP's Accreditation Notice may include a condition requiring that the ACP's record keeping arrangements are consistent with the *Record Keeping Guide*.

Tables 7.1-7.5 below describe the minimum documents ACPs are required to keep as a record of the energy savings from the project. For each implementation, ACPs must collect:

- the records described in Table 7.1
- the records described in the Table relevant to the MBM calculation sub-method being used to calculate energy savings, and
- if relevant, the records described in Table 7.5 for each implementation from 31 July 2018 that includes a lighting upgrade.

You must collect the required documents for each implementation of your activity.

Table 7.1 Minimum required records for all implementations

Requirement	Document	Description
Original Energy Saver	Energy bill **And**	The document must be current (as of the implementation date) and must clearly show the name and address of the original energy saver. The address on the energy bill must match the implementation address. Where the energy bill does not match the implementation address (e.g. it is addressed to a PO Box) additional documentation must be provided which links the energy bill to the implementation address.
	Other documentation showing that the original energy saver is liable for the energy used	The documentation must show: • the address of the implementation, and • the party responsible for paying the energy costs, as at the implementation date. Examples of such documents include a tenancy agreement stating that the tenant is responsible for the energy used, or an internal company invoice showing responsibility for energy costs.
Implementation Date	Commissioning report or tax invoice	The document must clearly show: • the date the work was conducted • the address where the work took place, and • the equipment installed. If normal operations are to commence after a commissioning period, details of the commissioning process should be included in the nomination form or in formal project documentation.
Implementation address	Energy bill **or** tax invoice	The document must clearly show: • the date the work was conducted, and • the address where the work took place.
Nomination	Nomination form	The nomination form must: • be in the required form (i.e., using the relevant template available from the ESS website), and • be signed by the original energy saver on or before the implementation date.
RESA boundary and Metering equipment	Electrical line diagram or piping and instrument diagram (P&ID) **And**	The document must clearly show the location of the meter(s) used in the measuring the electricity or gas consumption.
	Meter information **And**	The document must clearly show: • meter make and model number, • other details, such as whether any recent audits of metering equipment have been undertaken, and • calibration records including the testing and calibration process, and responsibilities, and the last calibration date and validation date. Documentation can include manuals, photographs, etc.
	Electricity metering equipment details **and/or**	The document(s) must clearly show: • meter application, e.g. AC Electric Power (watts) or AC Energy (watt-hours), • meter category, e.g. true RMS watt meter or watt-hour meter, and • meter type, e.g. digital meter that measures watts and/or watt-hours and uses digital sampling (IEEE 519-1992) to properly measure distorted waveforms.

Requirement	Document	Description
	Gas metering equipment details	The document(s) must clearly show: • meter application, e.g. volumetric or mass flow meter, • meter category, e.g. intrusive or non-intrusive meters, and • meter type, e.g. turbine flow meters.
Calculations	The spreadsheet or calculation tool used to calculate energy savings from each implementation.	The document must clearly show the calculation of energy savings, and the data inputs and factors applied as required by the ESS Rule.

Table 7.2 Minimum required records for Method 1 – Baseline per unit of output

Requirement	Document	Description
Evidence to support use of Method 1	Linear regression model **And**	The linear regression model must verify that the relationship between the energy consumption and the output at each site is linear. The equation of the line must be clearly stated on the graph and a statistical analysis must be conducted (including, but not limited to, the R^2 value) to demonstrate that the relationship is reasonable.
	Fixed energy consumption **And**	Provide an explanation of the 'fixed' electricity and/or gas consumption at each site, or the calculation itself.
	Output variation	Describe the process used to check that the output has not varied by more than 50% from the average output over the baseline period, for each site.
Measurement periods	Baseline period, after measurement period and the length of the measurement periods **And**	Records must be kept to justify the use of the proposed baseline period, the after measurement period and the length of the measurement periods T_b and T_a. The evidence provided must support the rationale for the: • baseline period that has been selected • number of measurement periods Tb the baseline period comprises • after measurement period (i.e. the RESA expected lifetime), and • number of measurement periods T_a that the expected RESA lifetime will allow
	Baseline period	Evidence for the baseline period will need to be collected for each site that is the subject of an implementation, including: • supporting documents for the measurement periods T_b to justify use of the proposed baseline period • rationale for why the measurement periods T_b have been selected, and • how many 'n' measurement periods T_b have been or will be used as the basis for the baseline period calculations.
Energy Savings	Fixed energy consumption **And**	Evidence of how the figure accounting for the fixed consumption has been derived or measured with the results of: • any sub-metering equipment on site, or • an extrapolation from energy bills.
	Total energy consumption **And**	Evidence to support the figures for total energy consumption with the results of: • any sub-metering equipment on site, or • data provided by the energy retailer (using the utility's revenue grade meters).
	Output	Evidence must be collected for the output T_b and output T_a amount at the site: • a detailed explanation of how you measured or calculated the production output or units of production, and • evidence to support this (e.g., electronic product inventories, stock control, loading dock records).
Calculations	The spreadsheet or calculation tool used to calculate energy savings from each implementation.	The document must clearly show the calculation of energy savings, and the data inputs and factors applied as required by the ESS Rule.

Table 7.3 Minimum required records for Method 2 – Baseline unaffected by output

Requirement	Document	Description
Evidence to support use of Method 2	Linear regression model **or** energy consumption **and** assessment of external variables on energy consumption	To be able to use the MBM – Baseline unaffected by output method the following evidence must be collected: • For a production site: a linear regression model to verify that the relationship between energy consumption and output at the site is not statistically relevant. • For a service site: evidence that verifies that energy consumption remains reasonably constant regardless of the amount of people serviced. • For either production or service site cases: a process or an analysis which demonstrates that no external variables affect the energy consumption at each site
Measurement periods	Baseline period, after measurement period and the length of the measurement periods **And**	Evidence to justify the use of the proposed baseline period, the after measurement period and the length of the measurement periods T_b and T_a must support the rationale for the: • baseline period that has been selected • number of measurement periods T_b the baseline period comprises • after measurement period (i.e. the RESA expected lifetime), and • number of measurement periods T_a that the expected RESA lifetime will allow
	Baseline period	The following evidence must be collected for each implementation: • supporting documents for the measurement periods T_b to justify use of the proposed baseline period • rationale for why these measurement periods T_b have been selected, and • how many 'n' measurement periods T_b have been or will be used as the basis for the baseline period calculations.
Baseline – energy consumption	Total consumption (for calculating the baseline)	Evidence must be collected to support the figures for total energy consumption with the results of: • any sub-metering equipment on site, or • data provided by the energy retailer (using the utility's revenue grade meters).
Calculations	The spreadsheet or calculation tool used to calculate energy savings from each implementation.	The document must clearly show the calculation of energy savings, and the data inputs and factors applied as required by the ESS Rule.

Table 7.4 Minimum required records for Method 3 – Normalised baseline

Requirement	Document	Description
Evidence to support use of Method 3	Linear regression model	To be able to use the MBM – Normalised baseline method the following evidence must be collected: • A linear regression model to verify the relationship between energy consumption and the proposed normalisation variable(s) selected for each site. This must include a statistical analysis (including, but not limited to, the R^2 value) to demonstrate that the relationship is reasonable. Statistically, an R^2 value equal to or higher than 0.75 indicates a good correlation.
Measurement periods	Baseline period, after measurement period and the length of the measurement periods **And**	Evidence to justify the use of the proposed baseline period, the after measurement period and the length of the measurement periods T_b and T_a must support the rationale for the: • baseline period that has been selected • number of measurement periods T_b the baseline period comprises • after measurement period (i.e. the RESA expected lifetime), and • number of measurement periods T_a that the expected RESA lifetime will allow
	Baseline period	The following evidence must be collected for each implementation: • supporting documents for the measurement periods T_b to justify use of the proposed baseline period • rationale for why these measurement periods T_b have been selected, and • how many 'n' measurement periods T_b have been or will be used as the basis for the baseline period calculations.
Normalised energy consumption	Total consumption	Evidence must be collected to support the figures for total energy consumption with the results of: • any sub-metering equipment on site, or • data provided by the energy retailer (using the utility's revenue grade meters).
Calculations	The spreadsheet or calculation tool used to calculate energy savings from each implementation.	The document must clearly show the calculation of energy savings, and the data inputs and factors applied as required by the ESS Rule.

Table 7.5 Minimum required records for all implementations that include a Lighting Upgrade (from 31 July 2018)

Requirement	Document	Description
Equipment requirements	Manufacturers' specifications **And**	The document must show • the model name or number of the product, and • the specifications of the product.
	Acceptance by the Scheme Administrator (where required)	Refer to the *Product Applications Guide.*

8 Glossary

Words which are defined in the ESS Rule and which are used in this Method Guide have the same meaning in this Method Guide as in the ESS Rule, unless the context requires otherwise.

Term	Definition
After measurement period	A time period after the implementation, which can consist of one or more measurement periods T_a (depending on the lifetime of the equipment that is the subject of the implementation).
Baseline period	A time period before the implementation, which can consist of one or more measurement periods T_b.
Confidence factor	A factor applied to the energy savings calculations, which determines unexplained variance in the baseline energy consumption.
Fixed consumption	The consumption of electricity or gas at the site that does not vary with changes in output.
Implementation and commissioning period	The time period in which the new process or end user equipment is installed and tested to verify that it functions according to its design specifications.
Measurement period T_b	A time period before implementation that is representative of energy use on the site in the absence of the implementation. It is the base unit from which baseline calculations are made.
Measurement period T_a	A time period after implementation that must be of the same duration as the measurement period T_b.
Output	The number of units of output or production during each time period.
PIAM&V method	The Project Impact Assessment with Measurement and Verification Method, as defined in clause 7A of the ESS Rule.

Appendices

A Method 1 – Baseline per unit of output

This Appendix is about Method 1 – Baseline per unit of output. It provides information for applicants and ACPs about:

- the criteria that must be addressed to use Method 1 to calculate energy savings from a project, and
- the steps required to calculate energy savings using Method 1.

A.1 Criteria for Method 1

This method should be used if **energy consumption is strongly linked to output**. Where the relationship is non-linear or there are multiple products or changes in raw materials affecting consumption, another method of normalising the baseline should be used.

In order to calculate savings using this method certain criteria identified in clause 8.5.1 of the ESS Rule must be satisfied. These criteria are described below.

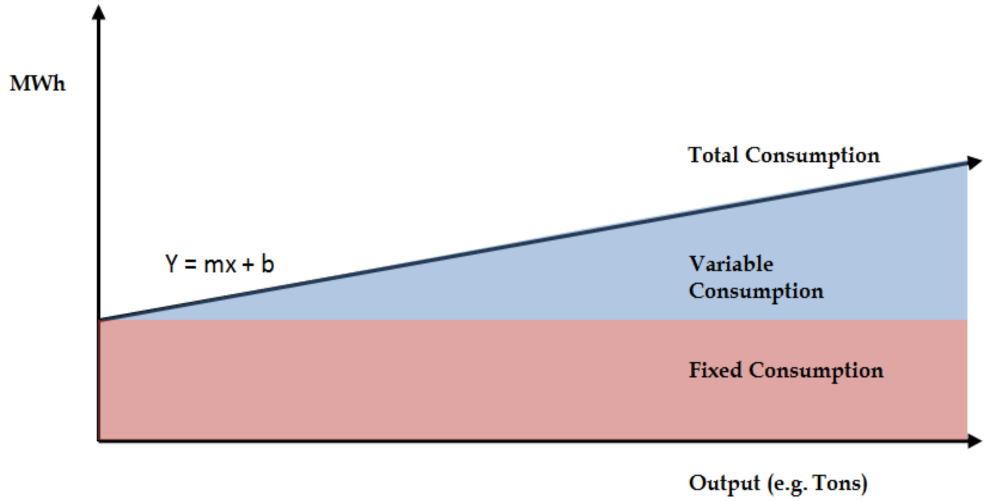
A.1.1 The energy consumption for the site is a linear function of output

A linear regression model must be developed to verify that the relationship between the energy consumption and the output at the site is linear. The model should be presented as an x-y scatter graph, with energy consumption on the y-axis and output on the x-axis. The equation of the line should be clearly stated on the graph. A statistical analysis must be conducted (including, but not limited to, the R^2 value) to demonstrate that the relationship is reasonable. Statistically an R^2 value equal to or higher than 0.75 indicates a good correlation.[a]

Figure A.1 below represents the relationship between energy consumption and output, with consumption (y) being a function of output (x).

[a] Refer to Refer to Section B2.2.1 "Coefficient of determination (R2)" in Appendix B of the "*International Performance Measurement and Verification Protocol, Concepts and Options for Determining Energy and Water Savings - Volume I*" on Efficiency Valuation Organisation.

Figure A.1 Graph of energy consumptions versus output



A.1.2 The fixed energy consumption, which is the consumption of energy for the site that does not vary with variations in output, can be measured or estimated

The fixed energy consumption is the proportion of energy consumption that would remain constant if the relevant site (e.g. a production plant) were not to produce anything for a given period of time. This can be determined by estimating or extrapolating back to zero output from measurements taken during plant downtime or can be estimated mathematically from multiple periods.

The fixed energy consumption must:

- be a reasonable reflection of the consumption that is unaffected by output
- lead to energy savings calculations that are reasonable, and
- be measured over a period before the implementation and commissioning period of the RESA commences (the duration of which is equal to the measurement period).

A.1.3 The variable energy baseline is calculated using data from periods immediately preceding the implementation date

The variable energy baseline may be up to a maximum of five years and must exclude any periods that are not representative of the long-term site consumption due to factors including plant shutdown or major maintenance. Where this is not possible, due to data unavailability or other reasons, a baseline may be set using other periods acceptable to the Scheme Administrator.

A.1.4 The output at the site for the after measurement period must not have changed by more than 50% from the average output over the baseline period

It is necessary to verify that the output has not varied by more than 50% from the average output over the period during which the variable energy baseline period is measured.

A.2 Calculating Energy Savings using Method 1

Clause 8.5 of the ESS Rule describes the MBM - Baseline per unit of output method (**Method 1**), and steps through the calculation of energy savings for this method.

This section follows the steps and formula contained in Method 1, and will assist with:

- developing the calculation spreadsheet to be submitted as part of an application for accreditation, and
- identifying evidence that must be collected when implementing this method.

All formula used should be clearly stated and referenced from the ESS Rule or other relevant source allowable under the ESS Rule in the calculation spreadsheet.

For implementations that increase either electricity consumption or gas consumption, both electricity savings and gas savings must be calculated.

A.2.1 Step 1 – Selecting the measurement period

Step 1 requires you to select the measurement period that will be the duration of time over which all measurements in this method will be taken.[i]

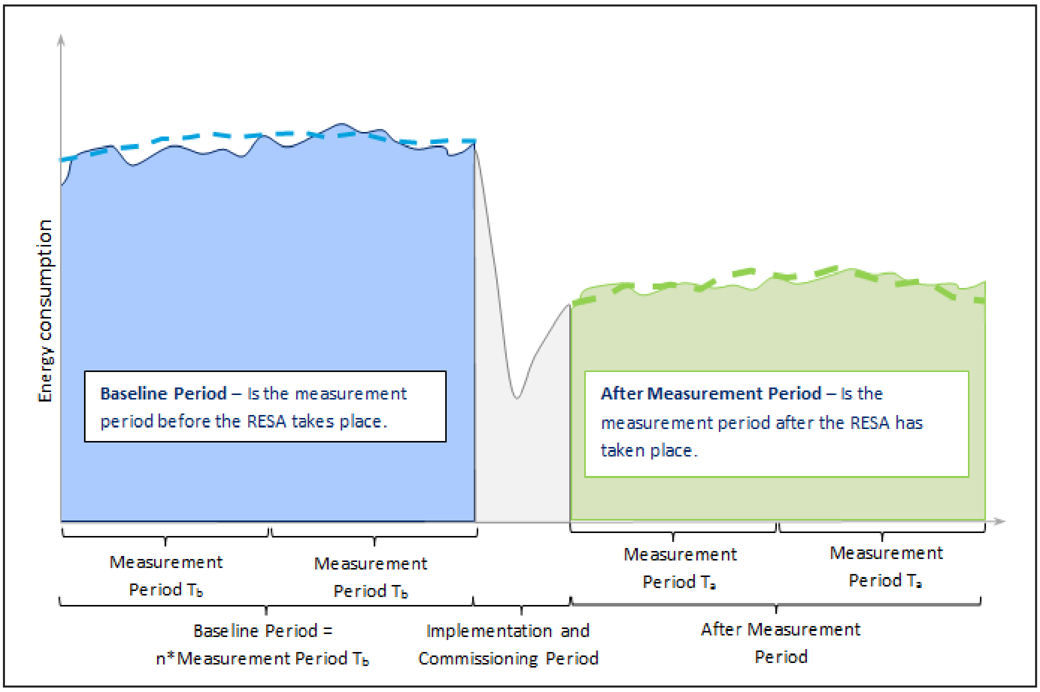
The measurement period must be defined for the calculations by defining the following discrete periods:

- the baseline period, which is made up of one or many measurement periods T_b before the implementation,
- the implementation and commissioning period, and
- the after measurement period, which will be made up of as many measurement periods T_a after the implementation as the expected RESA lifetime will allow.

Figure A.2 provides a schematic timeline of the measurement period and its components.

[i] Consider conditions in ESS Rule clauses 8.3 and 8.5.1(d) for the variable baseline when determining the measurement period.

Figure A.2 Schematic timeline of an MBM RESA's measurement period



As noted in Section 3.1 of this guide, the implementation date must be after the accreditation date. As such, any application for accreditation must be made before the implementation and commissioning period.

Sections A.2.1.1 to A.2.1.6 of this guide provide further information that will assist in determining appropriate measurement periods.

A.2.1.1 Determining the baseline period

The **baseline period** is the total period consisting of n measurement periods T_b before the implementation.

The baseline period must exclude any time periods that are not representative of normal operating conditions of the site (e.g. plant shutdown or major maintenance).

Determining the baseline period is a critical element for all ACPs using MBM to calculate energy savings. As such, the Scheme Administrator may require additional information from those applying to use MBM, regarding how the baseline has been, or will be, determined including evidence to support calculations of the baseline period or the measurement periods T_b.

The baseline energy consumption is calculated using data from periods immediately preceding the implementation date, up to a maximum of five years. Where this is not possible, due to data unavailability or other reasons, the baseline energy consumption may be set using other periods acceptable to the Scheme Administrator.[22]

An alternative baseline period may be appropriate if:

- it can be demonstrated that periods immediately preceding the implementation date are not suitable, and
- appropriate evidence for this can be provided.

Requests will be considered by the Scheme Administrator on a case by case basis.

A.2.1.2 Measurement periods T_b

The **measurement period T_b** is a defined period **before** implementation of the RESA that is representative of energy use at the site. It becomes the base unit from which baseline calculations are made.

One or more measurement periods T_b will constitute the baseline period. The measurement periods T_b must be:

- a minimum of one (1) day and a maximum of one (1) year, or
- a regular cycle of energy consumption that can be multiplied (by an integer number) to represent the energy consumption before the implementation.

The measurement periods T_b from before the implementation of the RESA must be defined and must be representative of energy use.

A.2.1.3 Implementation and commissioning period

The **implementation and commissioning period** is the time period in which the new process or end user equipment is installed and tested to verify that it functions according to its design specifications. When the performance of the new end user equipment or process is deemed satisfactory, normal operations are considered to have commenced.

A.2.1.4 Determining the after measurement period

The **after measurement period** is the time period, after implementation of the RESA, over which energy savings calculations can be made. This period is the duration of the expected lifetime of the RESA (e.g. new equipment expected lifetime) and it comprises as many measurement periods T_a as the expected RESA lifetime will allow. Refer to section 3.3 for information about the allowable lifespan of the baseline.

A.2.1.5 Measurement period T_a

The **measurement period T_a** is a defined period **after** implementation of the RESA that must be of the same duration as the measurement period T_b.

A.2.1.6 Measurement periods and ESC creation

The intended frequency of ESC creation should be considered when determining the T_b and T_a measurement periods, as actual measurements for an entire measurement period T_a will need to be undertaken before ESCs can be created.

For example, if the measurement periods T_b are for one year, then data will also need to be collected for one year for the measurement period T_a before any ESCs can be created.

However, the length of the measurement periods T_b and T_a is likely to impact on the confidence **factor** approved as part of an application for accreditation. Shorter measurement periods T_b and T_a are likely to decrease the confidence factor and result in a decrease in the total number of ESCs that can be created.

A.2.2 Step 2 – Determining the energy savings

Once the measurement periods have been determined, the next step is to:

1. complete steps 2A to 2D of Method 1 for each energy source for the baseline measurement periods T_b, and
2. complete steps 2E to 3 of Method 1 for each energy source for each measurement period T_a after implementation for which ESCs will be created (this will occur after accreditation).

These steps are explained in more detail in the sections below.

A.2.2.1 Step 2A – Determine the fixed consumption (in MWh)

The **fixed consumption** is the proportion of energy consumption that would remain constant if the production plant were to be taken off-line for a given period of time. As the fixed consumption is not expected to change as a result of the RESA, it is based solely on the period *before* implementation of the RESA.

Fixed consumption may be estimated and extrapolated from energy consumption measured during periods when the plant was offline. Alternatively, fixed consumption can be estimated or determined mathematically from multiple periods. It must be a reasonable reflection of the consumption unaffected by output, and lead to energy savings calculations that are reasonable. The fixed consumption is determined and applied to all the proposed measurement periods T_b contained within the baseline period.

A.2.2.2 Step 2B – Calculate the variable consumption (in MWh/units of output)

For calculating the **variable consumption T_b** for each measurement period T_b the following inputs are needed:

- the total consumption T_b (in MWh), and
- the output T_b (number of units of output). Each of these components is outlined below.

The total consumption of the site corresponds to the total metered amount of energy consumed at the site before the implementation for each of the defined measurement periods T_b.

Determining the output T_b for the site

Output T_b (or production) is the number of units of production output for each of the measurement periods T_b.

Details of the output from the site (within the RESA boundary) must be included as an input into Step 2B of Method 1. To do this, details of the total output from the site **before** the implementation for each of the defined measurement periods T_b must be recorded.

The **Output T_a,** which is the output from the site after the implementation, will be an ongoing input to the calculation methodology and will need to be input for each measurement period T_a.

In each case, the output (e.g., litres, tonnes, pieces, etc.) must be specified in the same way in the T_b and T_a measurement periods.

Calculate the variable consumption T_b

Once the above two parameters for '*n*' measurement periods T_b have been calculated, along with the fixed consumption, the variable consumption T_b (in MWh / unit of output) for each of the measurement periods T_b, using the formula in Step 2B of Method 1 can be calculated.

$$Variable\ consumption_{Tb} = \frac{Total\ Consumption_{Tb} - Fixed\ Consumption}{Output_{Tb}}$$

A.2.2.3 Step 2C – Calculate the variable baseline (in MWh/units of output)

The variable baseline is calculated as per Step 2C of Method 1 in the ESS Rule and is measured in MWh /unit of output. It is the average of all the variable consumption values calculated in Step 2B for the entire baseline period.

Calculate the variable consumption T_b

Once the above two parameters for '*n*' measurement periods T_b have been calculated, along with the fixed consumption, the variable consumption T_b (in MWh / unit of output) for each of the measurement periods T_b, using the formula in Step 2B of Method 1 can be calculated.

$$Variable\ baseline = \left(\sum_{T=1}^{n} Variable\ consumption_{Tb}\right) / \ n$$

A.2.2.4 Step 2D – Calculate the baseline variability (in MWh/units of output)

The baseline variability (in MWh/units of output) is calculated based on the highest and lowest values of energy used per unit of output over the baseline period. It is the unexplained variance in the baseline for each measurement period T_b.

The baseline variability will differ based on the number of measurement periods T_b used to calculate the baseline consumption.

Step 2D of Method 1 of the ESS Rule prescribes how to calculate baseline variability, depending on the nominated number of measurement periods T_b.

- If more than two measurement periods T_b are used in the calculations, the difference between the maximum variable consumption T_b and minimum variable consumption T_b recorded across all your measurement periods T_b should be halved, as follows:

$$Baseline\ variability = \frac{\text{maximum}\ Variable\ Consumption_{Tb} - \text{minimum}\ Variable\ Consumption_{Tb}}{2}$$

- If two or fewer measurement periods T_b are used in the calculations, the baseline variability is 10% of the variable baseline.

A.2.2.5 Step 2E – Calculate reduced consumption (in MWh)

Step 2E of Method 1 of the ESS Rule should be used to calculate the Reduced Consumption for each measurement period T_a.

$$Reduced\ Consumption = (Output_{Ta} \times Variable\ Baseline + Fixed\ Consumption) - Total\ Consumption_{Ta}$$

Where:

- T_a denotes a time period, after the implementation date, the duration of which is equal to the measurement period T_b
- Total consumption Ta (in MWh) is the consumption of energy for the site measured by metering that consumption over a measurement period T_a, and
- Output T_a is the number of units of output during the time period T_a (as explained in section A.2.2.2 above).

This step must be repeated for each energy source for each measurement period T_a.

A.2.2.6 Step 2F – Calculate confidence factor

The confidence factor reflects the degree of uncertainty in the calculations, information and assumptions that are used and is calculated using Step 2F of Method 1.

$$Confidence\ Factor = 1 - \left(\frac{Baseline\ Variability}{Variable\ Baseline}\right)$$

A.2.2.7 Step 2G – Calculate energy savings (in MWh)

To calculate the energy savings (in MWh) resulting from implementation of the RESA, perform the following calculation specified in Step 2G of Method 1 of the ESS Rule.

If measuring electricity consumption:

$$Electricity\ Savings = Reduced\ Consumption \times\ Confidence\ Factor \times\ Regional\ Network\ Factor$$

Where the *Regional Network Factor* is the value from Table A24 in Schedule A to the ESS Rule corresponding to the postcode of the address of the site or sites where the implementation took place.

If measuring gas consumption:

$$Gas\ Savings = Reduced\ Consumption \times\ Confidence\ Factor$$

A.2.3 Step 3 – Calculate net energy savings

The final step is to calculate the net energy savings from the implementation.

It is possible that an implementation designed to achieve electricity savings may increase gas consumption or vice versa. The energy savings of one energy source may be outweighed by the increased consumption of the other and result in negative net energy savings. The following formula is used to determine this.

$$\text{If } Electricity\ Savings \times Electricity\ Certificate\ Conversion\ Factor + Gas\ Savings \times Gas\ Certificate\ Conversion\ Factor < 0, \text{ then } Electricity\ Savings = 0 \text{ and } Gas\ Savings = 0$$

For implementations that increase either electricity consumption or gas consumption, both electricity savings and gas savings must be calculated.

A.3 Calculating ESCs

Once energy savings have been calculated from Step 2G, and the net energy savings (Step 3) are found to be >0, the number of ESCs can be calculated. For the calculation of ESCs, refer to Section 6 of this guide.

B Method 2 – Baseline unaffected by output

This Appendix is about Method 2 – Baseline unaffected by output. It provides information for applicants and ACPs about:

- the criteria that must be addressed to use Method 2 to calculate energy savings from a project, and
- the steps required to calculate energy savings using Method 2.

B.1 Criteria for Method 2

This method should be used to quantify energy savings where **energy consumption is independent of output** from a production or service site.

To use this method clause 8.6.1(a) of the ESS Rule must be met, in that **the consumption of all energy sources from the site must be independent of output**.

This method should be used when a RESA is implemented at a production site and the energy consumption at that site remains similar regardless of whether 1 or 1,000 units are produced.

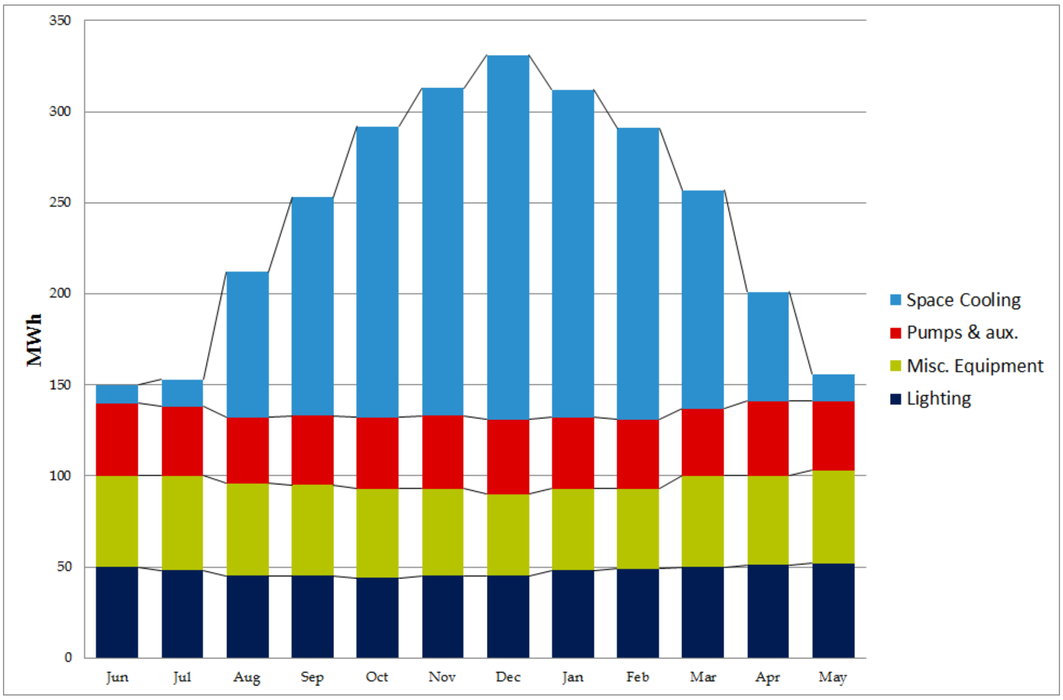
This method may also be used at sites at which a service is provided (e.g. in schools, hospitals, retail stores and hotels), where the amount of energy used remains reasonably constant regardless of the number of people using the service.

If this method is to be used for a RESA implemented at a production facility, a linear regression model must be developed to verify that there is no statistically relevant relationship between **electricity or gas consumption and output at the site**.

However, in both scenarios (production or service site), depending on the implementation boundary, it will need to be verified that there are no external variables that may cause a variation in the energy consumption at the site, such as weather conditions.

The following example provides additional guidance to understand the requirement. Figure B.1 below shows a typical electricity load curve at a particular site.

Figure B.1 Electricity Consumption (MWh) – load curve for building in temperate climate zone



In this example, the electricity consumption related to **'Space Cooling'** is heavily affected by the weather (i.e., the load increases in the warmer months). Under this scenario, there are three possible options:

1. If the RESA involves upgrades to the space cooling equipment, the MBM – Normalised Baseline method (Method 3, refer Appendix C) would be appropriate.
2. If the RESA:
   a. does not involve upgrades to the space cooling equipment, and
   b. the electricity consumption of the end-user equipment the subject of the RESA cannot be isolated with sub-metering,

   then MBM – Normalised Baseline method (Method 3, refer Appendix C) would be appropriate.
3. If the RESA:
   a. does not involve upgrades to the cooling equipment, and
   b. the electricity consumption of the end-user equipment the subject of the RESA can be isolated with sub-metering,

   then the MBM – Baseline unaffected by output method (e.g. this method) may be appropriate.

Depending on the implementation boundary, for scenarios 2 and 3 the PIAM&V method may also be suitable.

B.2 Calculating Energy Savings using Method 2

Clause 8.6 of the ESS Rule describes the MBM - Baseline unaffected by output method (**Method 2**), and steps through the calculation of energy savings.

This section follows the steps and formulae contained in Method 2, and will assist with:

- developing calculation spreadsheets, and
- identifying evidence requirements.

All formulae used should be clearly stated and referenced (from either the ESS Rule or other relevant source allowable under the ESS Rule) in calculation spreadsheets.

For implementations that increase either electricity consumption or gas consumption, both electricity savings and gas savings must be calculated.

B.2.1 Step 1 – Selecting the measurement period

Step 1 requires the selection of a measurement period that will be the duration of time over which all measurements in this method will be taken.[j]

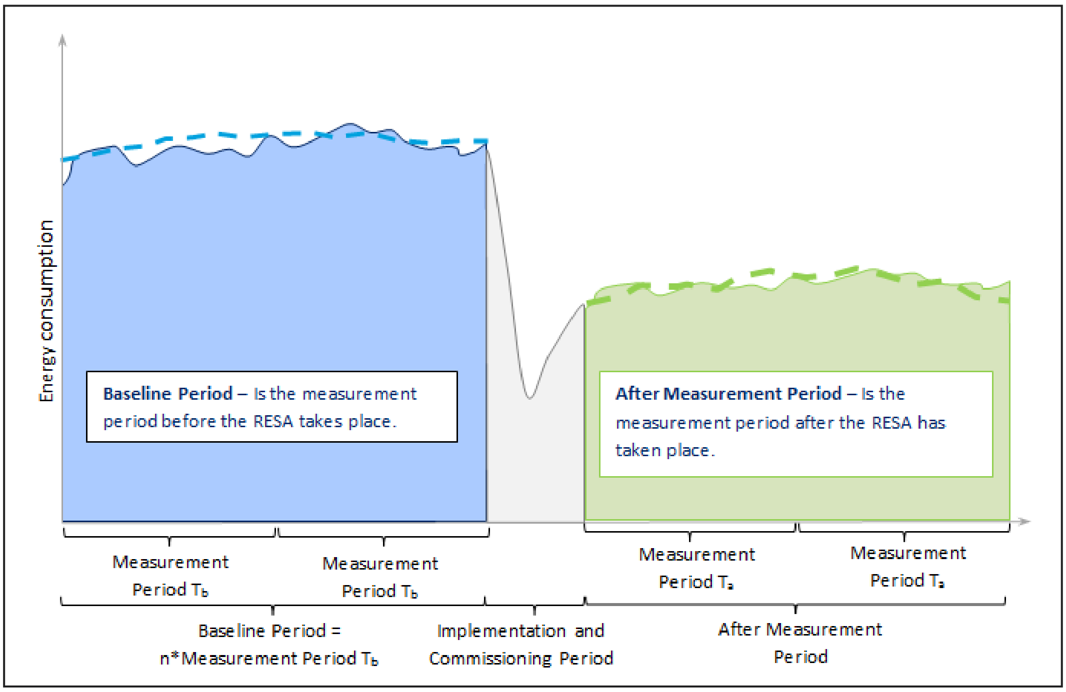
The measurement period used for calculations must be defined using the following discrete periods:

- the baseline period, which is made up of one or many measurement periods T_b before the implementation
- the implementation and commissioning period, and
- the after measurement period, which will be made up of as many measurement periods T_a after the implementation as the expected RESA lifetime will allow (up to a maximum of 10 years).

Figure B.2 provides a schematic timeline of the measurement period and its components.

[j] Consider conditions in clauses 8.3 and 8.6.1(b) of the ESS Rule for the baseline when determining the measurement period.

Figure B.2 Schematic timeline of an MBM RESA's measurement period



As noted in section 3.1 of this document, the implementation date must be after the accreditation date. As such, any application for accreditation must be made before the implementation and commissioning period.

Appendices B.2.1.1 to B.2.1.6 of this guide provide further information that will assist in determining appropriate measurement periods.

B.2.1.1 Determining the baseline period

The **baseline period** is the total period consisting of *n* measurement periods T_b before the implementation.

The baseline period must exclude any time periods that are not representative of normal operating conditions of the site (e.g. plant shutdown, major maintenance).

Determining the baseline period is a critical element for all ACPs using MBM. As such, additional information about how the baseline has been determined may be required.

The baseline energy consumption is calculated using data from periods immediately preceding the implementation date, up to a maximum of five years. Where this is not possible, due to data unavailability or other reasons, the baseline energy consumption may be set using other periods acceptable to the Scheme Administrator.[23]

An alternative baseline period may be appropriate if:

- it can be demonstrated to the Scheme Administrator that periods immediately preceding the implementation date are not suitable, and
- appropriate evidence for this can be provided.

Requests will be considered by the Scheme Administrator on a case by case basis.

B.2.1.2 Measurement period T_b

The **measurement period T_b** is a defined period **before** the implementation that is representative of energy use at the site. It becomes the base unit from which baseline calculations are made.

One or more measurement periods T_b will constitute the baseline period. The measurement periods T_b must be:

- a minimum of one (1) day and a maximum of one (1) year, or
- a regular cycle of energy consumption that can be multiplied (by an integer number) to represent energy consumption before the implementation.

Measurement periods T_b must be defined from periods before the implementation of the RESA that are representative of energy use.

B.2.1.3 Implementation and commissioning period

The **implementation and commissioning period** is the time period in which the new process or end user equipment is installed and tested to verify if it functions according to its design specifications. When the performance of the new end user equipment or process is deemed satisfactory, normal operations are considered to have commenced.

B.2.1.4 Determining the after measurement period

The after **measurement period** is the period over which energy savings calculations can be made. This period is the duration of the expected lifetime of the RESA (e.g., new equipment expected lifetime) and it comprises as many measurement periods T_a as the expected RESA lifetime will allow. Refer to section 3.3 for information about the allowable lifespan of the baseline.

B.2.1.5 Measurement periods T_a

The **measurement period T_a** is a defined period **after** the implementation that must be of the same duration as the measurement period T_b.

B.2.1.6 Measurement periods and ESC creation

When determining T_b and T_a measurement periods, the frequency with which ESCs will be created should be considered, as actual measurements for an entire measurement period T_a will need to be undertaken before ESC creation.

For example, if measurement periods T_b of one year are used, then data for one year for the measurement period T_a will need to be collected before ESC creation.

However, the length of the measurement periods T_b and T_a is likely to impact on the **confidence factor** approved as part of the application for accreditation. Shorter measurement periods T_b and T_a are likely to decrease the confidence factor and result in a decrease in the total number of ESCs that can be created.

B.2 Step 2 – Determining the energy savings

Once the measurement periods are determined, the next steps are:

- complete steps 2A and 2B of Method 2 for each energy source for the baseline measurement periods T_b, and
- complete steps 2C to 3 of Method 2 for each energy source for each measurement period T_a after the implementation.

These steps are explained in more detail in the sections below.

B.2.2.1 Step 2A – Calculate the baseline (in MWh)

For calculating the **baseline,** the **total consumption T_b** (in MWh) of the site will need to be determined.

The total **consumption T_b** of the site corresponds to the total metered amount of energy consumed at the site before the implementation, for each of the defined measurement periods T_b.

Once the total consumption T_b of the site has been determined, Step 2A of Method 2 under clause 8.6 of the ESS Rule is used to calculate the **baseline** using each measurement period T_b.

$$Baseline = \left(\sum_{T=1}^{n} Total\ consumption_{Tb}\right) / \ n$$

B.2.2.2 Step 2B – Calculate baseline variability (in MWh)

The **baseline variability** is calculated based on the highest and lowest values of energy used in the baseline period. It is the unexplained variance in the baseline for each measurement period T_b.

The baseline variability calculation will differ based on the number of measurement periods T_b contained within the baseline period.

Step 2B of Method 2 of the ESS Rule prescribes how to calculate baseline variability, depending on the number of measurement periods T_b you have nominated:

- If two or more measurement periods T_b are used in the calculations, the difference between the maximum total consumption T_b and minimum total consumption T_b, recorded across all your measurement periods T_b should be halved, as follows:

$$Baseline\ variability = \frac{\text{maximum}\ Variable\ Consumption_{Tb} - \text{minimum}\ Variable\ Consumption_{Tb}}{2}$$

- If only one measurement period T_b is used in the calculations, the baseline variability is 10% of the baseline.

B.2.2.3 Step 2C – Calculate reduced consumption (in MWh)

Step 2C of Method 2 is used to calculate the reduced consumption for each measurement period T_a for the implementation, as follows:

$$Reduced\ Consumption = Baseline - Total\ Consumption_{Ta}$$

Where:

- T_a denotes a time period, after the implementation date, the duration of which is equal to the measurement period T_b, and
- Total Consumption T_a (in MWh) is the consumption of energy for the site measured by metering that consumption over a measurement period T_a.

This step must be repeated for each measurement period T_a.

B.2.2.4 Step 2D – Calculate confidence factor

Step 2D of Method 2 is used to calculate the confidence factor, which reflects the degree of uncertainty in the calculations, information and assumptions that are used, as follows:

$$Confidence\ Factor = 1 - \left(\frac{Baseline\ Variability}{Baseline}\right)$$

B.2.2.5 Step 2E – Calculate energy savings (in MWh)

Step 2E of Method 2 of the ESS Rule is used to calculate the energy savings (in MWh) resulting from the implementation, as follows:

If measuring electricity consumption:

$$Electricity\ Savings = Reduced\ Consumption \times\ Confidence\ Factor \times\ Regional\ Network\ Factor$$

Where the *Regional Network Factor* is the value from Table A24 in Schedule A to the ESS Rule corresponding to the postcode of the address of the site or sites where the implementation took place.

If measuring gas consumption:

$$Gas\ Savings = Reduced\ Consumption \times\ Confidence\ Factor$$

B.2.2.6 Step 3 – Calculate net energy savings

The final step is to calculate the net energy savings from the implementation.

It is possible that an implementation designed to achieve electricity savings may increase gas consumption or vice versa. The energy savings of one energy source may be outweighed by the increased consumption of the other and result in negative net energy savings. The following formula is used to determine this.

$$\text{If } \mathit{Electricity\ Savings} \times \mathit{Electricity\ Certificate\ Conversion\ Factor} + \mathit{Gas\ Savings} \times \mathit{Gas\ Certificate\ Conversion\ Factor} < 0, \text{ then } \mathit{Electricity\ Savings} = 0 \text{ and } \mathit{Gas\ Savings} = 0$$

For implementations that increase either electricity consumption or gas consumption, both electricity savings and gas savings must be calculated.

B.3 Calculating ESCs

Once energy savings have been calculated from Step 2E, and the net energy savings (Step 3) are found to be >0, the number of ESCs can be calculated. For the calculation of ESCs, refer to Section 6 of this guide.

C Method 3 – Normalised Baseline

This Appendix is about Method 3 – Normalised Baseline. It provides information for applicants and ACPs about:

- the criteria that must be addressed to use Method 3 to calculate energy savings from a project, and
- the steps required to calculate energy savings using Method 3.

C.1 Criteria for Method 3

This method should be used where an **explainable variation to energy consumption at the site can be removed** through normalisation against some other factor(s). That is, variation in the energy consumption caused from known changes in the conditions, under which the baseline is determined at the site, can be removed to create a normalised baseline.

If using this method, the criterion identified in clause 8.7.1(a) of the ESS Rule must be met in that:

- the **normalisation variables**, in respect of which the **total consumption** is normalised, are variables corresponding to the specific activities that are a reason for change in total consumption.

Therefore, the normalisation variables should:

- correspond to specific activities or situations that cause the change in the total energy consumption. These causes must be identifiable physical facts that affect the energy consumption of the equipment, and
- be expected to change routinely during the 'after' measurement periods, as could be the case with, for example:
  - weather conditions (e.g., heating or cooling degree days, or both)
  - substitution of the input mix of a manufacturing process, or
  - periodic or seasonal increases in production.

To evidence this, it must be verified that there is a **statistical correlation** between energy consumption at the site and the normalisation variables that have been identified.

Information from the process or operations affected by normalisation variables could be sourced from plant production logs, metering, meteorology data or other appropriate records. Depending on the complexity of the site, further information such as engineering drawings or more technical information may be necessary in order to meet these requirements.

For further guidance on the development of appropriate normalisation coefficients to account for the variation of **total consumption** refer to the IPMVP, Volume 1.[k]

C.2 Calculating energy savings using Method 3

Clause 8.7 of the ESS Rule describes the MBM - Normalised baseline method (**Method 3**), and steps through the calculation of energy savings for this method.

This section follows the steps and formulae contained in Method 3, and will assist with:

- developing calculation spreadsheets, and
- identifying evidence that must be collected.

All formulae used shall be clearly stated and referenced (from either the ESS Rule or other relevant source allowable under the ESS Rule) in the calculation spreadsheet.

For implementations that increase either electricity consumption or gas consumption, both electricity savings and gas savings must be calculated.

C.2.1 Step 1 – Selecting the measurement periods

Step 1 requires the selection of a measurement period that will be the duration of time over which all measurements in this method will be taken.[l]

The measurement period used for the calculations must be set by defining the following discrete periods:

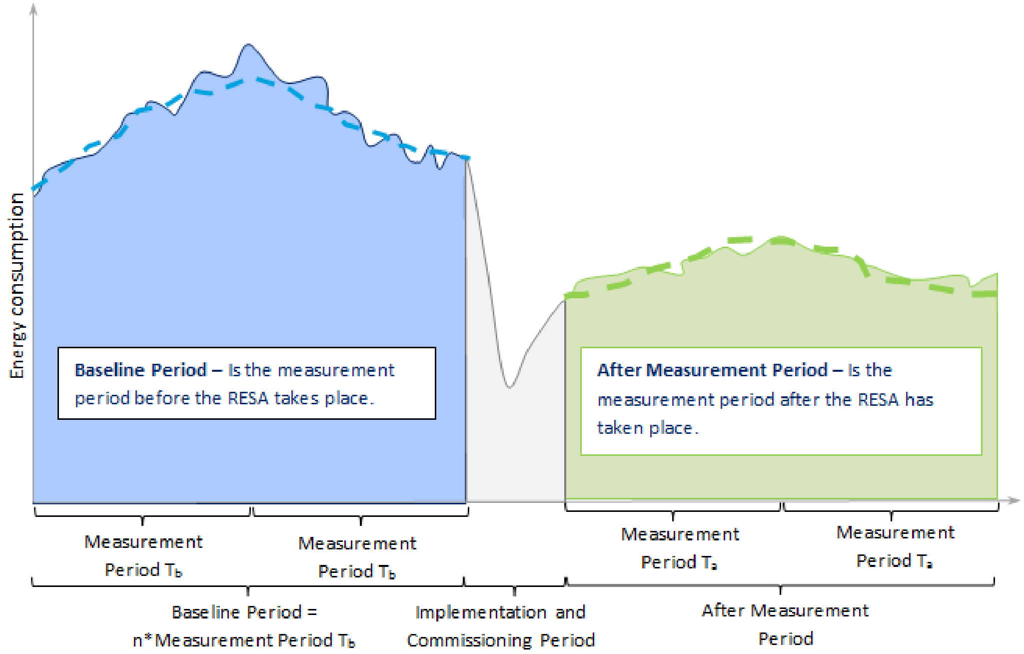
- the baseline period, which is made up of one or many measurement periods T_b before the implementation
- the implementation and commissioning period, and
- the after measurement period, which will be made up of as many measurement periods T_a after the implementation as the expected RESA lifetime will allow (up to a maximum of 10 years).

Figure C.1 provides a schematic timeline of the measurement period and its components.

[k] Efficiency Valuation Organisation, 2012 “International Performance Measurement and Verification Protocol, Concepts and Options for Determining Energy and Water Savings - Volume I” on Efficiency Valuation Organisation.

[l] Consider clauses 8.3 and 8.7.1(b) of the ESS Rule for the normalised energy baseline when determining the measurement period.

Figure C.1 Schematic timeline of an MBM RESA's measurement period



As noted in section 3.1 of this document, the implementation date must be after the accreditation date. As such, any application for accreditation must be made before the implementation and commissioning period.

Appendices C.2.1.1 to C.2.2.6 of this guide provide further information that will assist in determining appropriate measurement periods.

C2.1.1 Determining the baseline period

The **baseline period** is the total period consisting of *n* measurement periods T_b before the implementation.

The baseline period must exclude any time periods that are not representative of normal operating conditions of the site (e.g. plant shutdown, major maintenance).

Determining the baseline period is a critical element for all ACPs using MBM. As such, additional information of how the baseline has been determined may be required.

The baseline energy consumption is calculated using data from periods immediately preceding the implementation date, up to a maximum of five years. Where this is not possible, due to data unavailability or other reason, the baseline energy consumption may be set using other periods acceptable to the Scheme Administrator.[24]

It may be appropriate to use an alternative baseline period if it can:

- be demonstrated to the Scheme Administrator that periods immediately preceding the implementation date are not suitable, and
- appropriate evidence for this can be collected.

Requests will be considered on a case by case basis.

C2.1.2 Measurement periods T_b

The **measurement period T_b** is a defined period **before** the implementation that is representative of energy use at the site. It becomes the base unit from which baseline calculations are made.

One or more measurement periods T_b will constitute the baseline period. The measurement periods T_b must be:

- a minimum of one (1) day and a maximum of one (1) year, or
- a regular cycle of energy consumption that can be multiplied (by an integer number) to represent energy consumption before implementation of the RESA.

Measurement periods T_b from before the implementation, which are representative of energy use, must be defined.

C2.1.3 Implementation and commissioning period

The **implementation and commissioning period** is the time period in which the new processes or end user equipment is installed and tested to verify if it functions according to its design specifications. When the performance of the new end user equipment or processes is deemed satisfactory, normal operations are considered to have commenced.

C2.1.4 Determining the after measurement period

The **after measurement period** is the period over which energy savings calculations can be made. This period is the duration of the expected lifetime of the RESA (e.g., new equipment expected lifetime) and it comprises as many measurement periods T_a as the expected RESA lifetime will allow. Refer to section 3.3 for information about the allowable lifespan of the baseline.

C2.1.5 Measurement periods T_a

The measurement period T_a is a defined period **after** the implementation that must be of the same duration as the measurement period T_b.

C2.1.6 Measurement periods and ESC creation

When determining T_b and T_a measurement periods, the frequency of ESC creation should be considered, as actual measurements for an entire measurement period T_a must be undertaken before ESC creation.

For example, if measurement periods T_b of one year are used, then data will need to be collected for one year for the measurement period T_a before ESC creation.

However, the length of the measurement periods T_b and T_a is likely to impact on the **confidence factor** approved as part of the application for accreditation. Shorter measurement

C.2.2 Step 2 – Determining the energy savings

Once the measurement periods have been determined, Method 3 now requires the completion of steps 2A to 2F. Method 3 also requires you to complete steps 2D to 3 for each measurement period T_a for which ESCs will be created.

These steps are explained in more detail in the sections below.

C2.2.1 Step 2A – Calculate the normalised consumption (in MWh)

For calculating the **normalised consumption T_b** the **total consumption T_b**(in MWh) of the site will need to be determined.

The total consumption T_b of the site corresponds to the total metered amount of energy consumed at the site before the implementation, for each of the defined measurement periods T_b.

The total metered amount of energy consumed at the site before the implementation will need to be determined, for each of the nominated measurement periods T_b.

Once the total consumption T_b for each of the measurement periods T_b has been determined, Step 2A of Method 3 should be used to calculate the normalised consumption T_b (in MWh) for *n* time periods T_b. This is done by normalising the total consumption T_b to determine the consumption that would have occurred for the measurement period T_b had the conditions at the time of measurement period T_a existed, using:

a. a set of normalisation coefficients, which are one or more coefficients calculated to account for the variation in total consumption T_b per unit of change for each corresponding normalisation variable used in (b) below, and
b. a set of values, which are the difference between the values of the normalisation variables for each time period T_b, and the values of the normalisation variables for one time period T_a, determined by measurements or other data sources.

Reasons for the variation in total consumption T_b before the implementation should be explained, for example:

- variations in ambient conditions,
- variations in input characteristics, or
- change in goods manufactured at certain times of the year.

For each of the reasons, and to account for the variation in total consumption T_b before the implementation, an appropriate **normalisation coefficient**[m] should be calculated to account for the variation of total consumption T_b. A set of values to correlate the normalisation variables between the periods before (measurement periods T_b) and after (measurement periods T_a) the implementation should be determined.

Regression analysis and other forms of mathematical modelling can determine the number of normalisation coefficients (independent variables) that contribute to the variation of total consumption T_b.

For further guidance on the development of appropriate normalisation coefficients, refer to the IPMVP, Volume 1.[n]

C2.2.2 Step 2B – Calculate the normalised baseline (in MWh)

Use Step 2B of Method 3 to calculate the **normalised baseline** for each of the ***n*** measurement periods T_b.

$$Normalised\ Baseline = \left(\sum_{T=1}^{n} Normalised\ consumption_{Tb}\right) / \ n$$

C2.2.3 Step 2C – Calculate the baseline variability (in MWh)

The **baseline variability** is calculated based on the highest and lowest normalised values of energy used in the baseline period. It is the unexplained variance in the baseline for each measurement period T_b.

The baseline variability will differ based on the number of measurement periods T_b used to calculate the reduced energy consumption as a result of the implementation.

Step 2C of Method 3 of the ESS Rule prescribes how to calculate baseline variability, depending on the number of measurement periods T_b that have been nominated.

- If two or more measurement periods T_b are used in the calculations, the difference between the maximum normalised consumption T_b and minimum normalised consumption T_b, recorded across all your measurement periods T_b should be halved as follows:

$$Baseline\ variability = \frac{\text{maximum } Normalised\ Consumption_{Tb} - \text{minimum } Normalised\ Consumption_{Tb}}{2}$$

- If only one measurement period T_b is used in the calculations, the baseline variability is 10% of the normalised baseline.

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m Normalisation coefficients refer to regularly changing parameters affecting the site energy use, and are also called independent variables.

n Efficiency Valuation Organisation, 2012 "International Performance Measurement and Verification Protocol, Concepts and Options for Determining Energy and Water Savings - Volume I" on Efficiency Valuation Organisation

C2.2.4 Step 2D – Calculate the reduced consumption (in MWh)

Step 2D of Method 3 of the ESS Rule should be used to calculate the **reduced consumption** for each measurement period T_a.

$$Reduced\ Consumption = Baseline - Total\ Consumption_{Ta}$$

Where:

- T_a denotes a time period, after the implementation date, the duration of which is equal to the measurement period T_b, and
- **Total Consumption T_a** (in MWh) is the consumption of energy for the site measured by metering that consumption over a measurement period T_a.

This step must be repeated for each measurement period T_a.

C2.2.5 Step 2E – Calculate confidence factor

Step 2E of Method 3 of the ESS Rule should be used to calculate the **confidence factor** which reflects the degree of uncertainty in the calculations, information and assumptions that are used.

$$Confidence\ Factor = 1 - \left(\frac{Baseline\ Variability}{Baseline}\right)$$

C2.2.6 Step 2F – Calculate energy savings (in MWh)

Step 2F of Method 3 of the ESS Rule should be used to calculate the energy savings (in MWh) resulting from the implementation.

If measuring electricity consumption:

$$Electricity\ Savings = Reduced\ Consumption \times\ Confidence\ Factor \times\ Regional\ Network\ Factor$$

Where the *Regional Network Factor* is the value from Table A24 in Schedule A to the ESS Rule corresponding to the postcode of the address of the site or sites where the implementation took place.

If measuring gas consumption:

$$Gas\ Savings = Reduced\ Consumption \times\ Confidence\ Factor$$

C.3 Step 3 – Calculate net energy savings

The final step is to calculate the net energy savings from the implementation.

It is possible that an implementation designed to achieve electricity savings may increase gas consumption or vice versa. The energy savings of one energy source may be outweighed by the increased consumption of the other and result in negative net energy savings. The following formula is used to determine this.

$$\text{If } \textit{Electricity Savings} \times \textit{Electricity Certificate Conversion Factor} + \textit{Gas Savings} \times \textit{Gas Certificate Conversion Factor} < 0, \text{ then } \textit{Electricity Savings} = 0 \text{ and } \textit{Gas Savings} = 0$$

For implementations that increase either electricity consumption or gas consumption, both electricity savings and gas savings must be calculated.

C.4 Calculating ESCs

Once energy savings have been calculated from Step 2F, and the net energy savings (Step 3) are found to be >0, the number of ESCs can be calculated. For the calculation of ESCs, refer to Section 6 of this guide.

D Fuel switching activities

Under clause 5.3(e)(iii) of the ESS Rule, fuel switching (from electricity to gas or from gas to electricity) that increases the efficiency of energy consumption may constitute a RESA, provided the activity meets certain criteria.

Figure D.1 may assist potential applicants for accreditation to determine if a proposed fuel switching project is eligible to be treated as a RESA under the ESS.

Some project examples are included in Tables D.1 and D.2 below for further reference.

Figure D.1 Flowchart of eligible fuel-switching activities

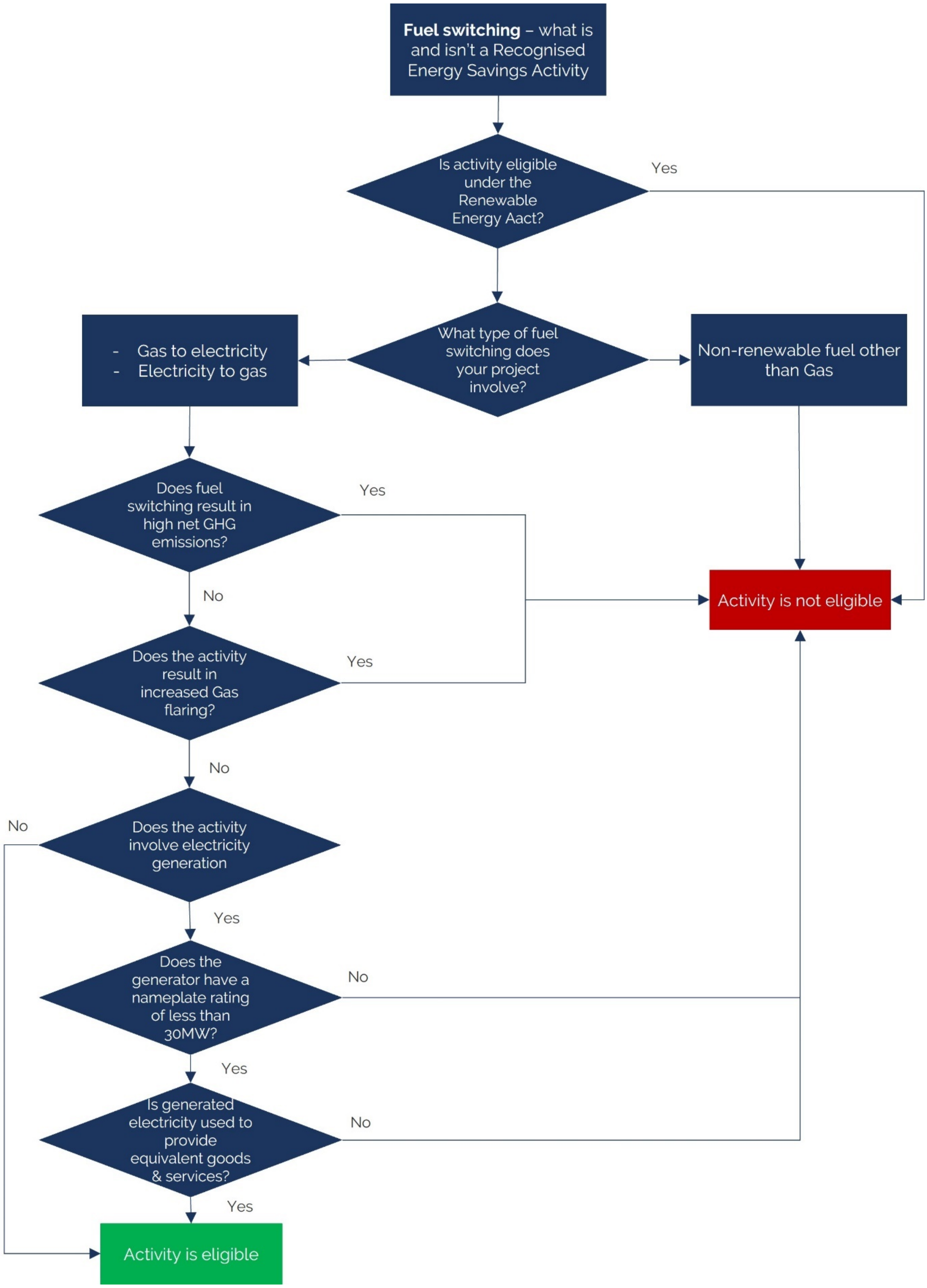

Table D.1 Examples of fuel switching activities eligible under the ESS

Eligible activity	Example
Gas to Electricity	• Installing a gas engine, cogeneration or trigeneration unit with a power generation capacity of less than 30MW, where all generated electricity is used onsite for the production of goods and/or services (i.e. no power exports). • Replacing gas-fired heating equipment with electric heating equipment.[o]
Electricity to gas	• Replacing electric heating equipment with gas-fired equipment.[p] • Replacing an electrical drive or electrically driven equipment[q] with gas-powered equipment.

Table D.2 Examples of fuel switching activities that are not eligible under the ESS

Eligible activity	Example
Gas or electricity to other fuels (renewable and non-renewable)	• Replacing a gas-fired boiler with a: – coal-fired boiler – biogas-fired boiler, or – biomass boiler. • Retrofitting a dual gas burner on an existing boiler to replace natural gas with biogas.
Fuel switching that results in an increase in flaring	• Replacing a biogas-fired heater with an electric heater resulting in increased biogas flaring as less biogas is used (where biogas is generated onsite).
Fuel switching that results in an increase in net Greenhouse Gas (GHG) emissions	• Removing a gas cogeneration system to reduce gas consumption resulting in higher purchased electricity use and increased net GHG emissions. • Retrofit a dual gas burner on an existing cogeneration system to co-fire coal seam gas and reduce natural gas consumption. The switch to coal seam gas will result in higher GHG emissions due to the higher emission factor of coal seam gas compared to natural gas.
Fuel switching activity that is eligible to create tradeable certificates under the Renewable Energy (Electricity) Act 2000	• A 1MW biogas electric generator, which is eligible to create Large-scale Generation Certificates (LGCs) under the Renewable Energy Target (RET) scheme. Biogas is an eligible renewable energy source under the RET scheme to create renewable energy certificates.
Electricity generation where any generated power is not used to provide equivalent goods or services	• A 4MW cogeneration system that supplies more than 100% of a site's electrical consumption with the excess power exported to the grid.
Electricity generation from a generating system that has a nameplate rating greater than 30MW	• A 35MW cogeneration system running at 80% capacity. • Though the power output is less than 30MW the nameplate rating is greater than 30MW.

[o] Such as a furnace, water heater or steam producer using e.g. a resistance, induction or microwave heater.
[p] Heating equipment such as a furnace, kiln, dryer, water heater or steam generator.
[q] Such as air-conditioning systems, refrigeration compressors or pumps.

[1] Cl 98(2) of Schedule 4A, *Electricity Supply Act 1995*.
[2] Cls 153(2) and 151(2) of Schedule 4A, *Electricity Supply Act 1995*.)
[3] Cls 8.5.3., 8.6.3 and 8.7.3 of the *Energy Savings Scheme Rule of 2009*.
[4] Cls 8.5.2, 8.6.2 and 8.7.2 of the *Energy Savings Scheme Rule of 2009.*
[5] Cl 8.4 of the *Energy Savings Scheme Rule of 2009.*
[6] Cls 5.3 and 5.4 of the *Energy Savings Scheme Rule of 2009*.
[7] Cl 5.4(j) of the *Energy Savings Scheme Rule of 2009.* Further information is available on the Department of Climate Change, Energy, the Environment and Water (DCCEW) website.
[8] Cls 8.5.1(e), 8.6.1(c) and 8.7.1(c) of the *Energy Savings Scheme Rule of 2009.*
[9] Cl 10 of the *Energy Savings Scheme Rule of 2009* (definition of 'Gas').
[10] Cl 5.3A(b) of the *Energy Savings Scheme Rule of 2009.*
[11] Cl 8.4A of the *Energy Savings Scheme Rule of 2009.*
[12] Cl 8.4B.1 of the *Energy Savings Scheme Rule of 2009* and the *Product Applications Guide.*
[13] Cl 8.4B.2 of the *Energy Savings Scheme Rule of 2009.*
[14] Cl 6,5A of the *Energy Savings Scheme Rule of 2009*
[15] Cl 7A of the *Energy Savings Scheme Rule of 2009*
[16] Cl 6.5 of the *Energy Savings Scheme Rule of 2009*
[17] Cl 6.8 of the *Energy Savings Scheme Rule of 2009*.
[18] Cl 33(1) of Schedule 4A, *Electricity Supply Act 1995*. Cl 33(3) of Schedule 4A, *Electricity Supply Act 1995* provides this may be amended by regulation.
[19] Cl 37A(e) of the *Electricity Supply (General) Regulation 2014*. Cl 33A(1) of Schedule 4A, *Electricity Supply Act 1995* provides this is prescribed by regulation.
[20] Cls 46(1)-(2) of the *Electricity Supply (General) Regulation 2014.*
[21] Cls 46(3)-(4) of the *Electricity Supply (General) Regulation 2014.*
[22] Cl 8.5.1.(d) of the *Energy Savings Scheme Rule of 2009*
[23] Cl 8.6.1.(b) of the *Energy Savings Scheme Rule of 2009*
[24] Cl 8.7.1(b) of the *Energy Savings Scheme Rule of 2009*