Measurement and Verification in Victorian Energy Upgrades

Specifications – Version 8.0

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Document Version

Version 8.0 comes into effect from 20 June 2025. Versions 0.1 to 7.0 are no long in effect as at 20 June 2025.

Version	Amendments	In effect from
8.0	Introduction of specified measurement methods and changes to support project flexibility.	20 June 2025
7.0	Incorporating updated electricity emissions factors.	1 February 2022
6.0	Revised electricity emissions factors for 2021-2025.	1 August 2021
5.0	Inserted provisions to be applied when calculating abatement for M&V projects affected by COVID-19 or any other declared state of emergency or state of disaster.	30 June 2021
4.0	Introduced amendments which better support on-site renewable energy generation by allowing export of renewable energy outside of the measurement boundary.	18 December 2020
3.0	Introduced amendments to make this document easier to use, including, without limitation, changes to: • allow for a single project to include multiple essentially identical upgrades at multiple essentially identical premises • the use of non-uniform utility data • the use of different measurement frequencies for different measurement boundaries • enabling multiple methods of certificate creation as appropriate for each measurement boundary.	12 September 2019
2.0	Revised to align with the introduction of the Victorian Energy Efficient Target Regulations 2018.	10 December 2018
1.0	Secretary approved	19 June 2017

We acknowledge and respect Victorian Traditional Owners as the original custodians of Victoria's land and waters, their unique ability to care for Country and deep spiritual connection to it.

We honour Elders past and present whose knowledge and wisdom has ensured the continuation of culture and traditional practices.

DEECA is committed to genuinely partnering with Victorian Traditional Owners and Victoria's Aboriginal community to progress their aspirations.

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Contents

1 Introduction

The Measurement and Verification Specifications (the specifications) provide methods and variables for the Measurement and Verification method and Specified Measurement Methods in project-based activities in the Victorian Energy Upgrades program. These are contained within this document, the specifications.

These specifications are made by the Secretary of the Department of Energy, Environment and Climate Action under regulation 18 of the Victorian Energy Efficiency Target (Project-Based Activities) Regulations 2017.

1.1 Purpose

This document sets out the specifications for calculating the carbon dioxide equivalent (in tonnes) of greenhouse gases using the Measurement and Verification method and Specified Measurement Methods to be reduced by carrying out a prescribed activity.

1.2 Legislation and responsibilities

The Victorian Energy Upgrades program is enabled by the Victorian Energy Efficiency Target (VEET) Act 2007, the Victorian Energy Efficiency Target Regulations 2018 (the VEET Regulations 2018), the Victorian Energy Efficiency Target (Project-Based Activities) Regulations 2017 (the VEET PBA Regulations 2017) and the Victorian Energy Efficiency Target Guidelines (the Guidelines).

The Department of Energy, Environment and Climate Action (the department) supports the Minister in overseeing the Victorian Energy Upgrades legislation.

This document sets out the rules for defining the methods and variables to be used when carrying out a prescribed activity using the Measurement and Verification method and Specified Measurement Methods for the purpose set out in the PBA Regulations. This document applies the DEECA publication *Accounting for COVID-19 Under VEU (2021)* as amended from time to time, which specifies how rules for defining methods and variables should be amended during a State of Emergency, State of Disaster or applied to non-routine events.

The Essential Services Commission (ESC) is the administrator of the Victorian Energy Upgrades program and is responsible for the Guidelines. Participants must also comply with the ESC's requirements, which are published on their website at www.esc.vic.gov.au/veu.

This document should be read in conjunction with the Act, Regulations and material published by the ESC.

1.3 Using this document

This document is divided into seven sections:

Variables and terms for all methods lists the general definitions, terms, methods and requirements for all methods under these specifications

Weather normalised whole of site electricity measurement (option C) sets out the specific method and variables applicable to this specified measurement method that must be provided in a scoping plan and project impact report

Weather normalised whole of site gas measurement (option C) sets out the specific method and variables applicable to this specified measurement method that must be provided in a scoping plan and project impact report

Retrofit isolation for non-seasonal motors and rotating equipment (option B) sets out the specific method and variables applicable to this specified measurement method that must be provided in a scoping plan and a project impact report

Direct measurement of solar PV (option D) sets out the specific method and variables applicable to this specified measurement method that must be provided in a scoping plan and a project impact report

Electrification direct measurement sets out the specific method and variables applicable to this specified measurement method that must be provided in a scoping plan and a project impact report

Measurement & Verification (M&V) sets out the method and variables applicable to all other projects, with exception to the five specified measurement methods mentioned above, that must be provided in a scoping plan, a project plan and a project impact report.

2 Variables and terms for all methods

2.1 Definitions

Annual creation or top up means the annual energy savings from which VEECs can be calculated and created using measured annual energy consumption. To determine the annual energy savings from which VEECs can be created, a baseline model for each measurement boundary which establishes the baseline period and the energy consumed in that measurement boundary during the reporting period must be measured and compared;

Counted savings means the reduction of carbon dioxide equivalent (in tonnes) of greenhouse gases represented by certificates created in respect of upgrades undertaken within the measurement boundary during project baseline and operating period;

Baseline period means, in relation to a measurement boundary, typically a 12-month period of measurement that occurs before the energy efficiency measures have been installed, to establish a reasonably accurate and reliable estimate of the measured energy consumption from which a baseline energy model can be developed;

Effective range means the range of values of the variable used to develop the baseline and operating models, (i.e. the maximum and the minimum values) and the values of any tolerances the relevant method allows;

Emissions factor means the variable used to determine the equivalent number (in tonnes) of greenhouse gases avoided by a given amount of energy use avoided. That is:

(a) for electricity when energy savings are calculated using a forward creation method with an implementation start time:
- between 1 August 2021 and 31 January 2022 is 0.9546 (T CO2-e/MWh);
- between 1 February 2022 and 31 January 2023 is 0.8142 (T CO2-e/MWh);
- between 1 February 2023 and 31 January 2024 is 0.6738 (T CO2-e/MWh);
- between 1 February 2024 and 31 January 2025 is 0.5334 (T CO2-e/MWh);
- after 1 February 2025 is 0.3930 (T CO2-e/MWh).

(b) for electricity when energy savings are calculated using an annual creation or top up method with the first time interval[1]:
- between 1 August 2021 and 31 January 2022 is 0.98 (T CO2-e/MWh);
- between 1 February 2022 and 31 January 2023 is 0.96 (T CO2-e/MWh);
- between 1 February 2023 and 31 January 2024 is 0.85 (T CO2-e/MWh);
- between 1 February 2024 and 31 January 2025 is 0.79 (T CO2-e/MWh);
- between 1 February 2025 and January 2026 is 0.77 (T CO2-e/MWh);
- after 1 February 2026 is to be confirmed.

(c) for natural gas is 0.05523 (T CO2-e/GJ);
(d) for liquefied petroleum gas is 0.0642 (T CO2-e/GJ);
(e) for solar, wind, hydroelectric, geothermal and ocean energy is zero;
(f) for any other renewable energy is the relevant emissions factor for the renewable energy listed in Section 2.1 of the National Greenhouse Accounts Factors published by the Commonwealth Department of the Environment in August 2016.

Estimate of the mean means a model based on the values of the measured energy consumption within the measurement boundary during the baseline period (for a baseline energy model) or operating period (for an operating energy model), where site constants are at their normal values and where the coefficient of variation of the measured energy consumption over the period is less than 15%; and is based on at least 80% of the total number of time intervals in the baseline period (for a baseline energy model) or the operating period (for an operating energy model);

[1] These specifications will be updated prior to 1 February each year to insert the applicable National Greenhouse Accounts emissions factor for indirect (scope 2) emissions for consumption of purchased electricity for Victoria that was published the previous August.

Forward creation means using normal year or measured energy savings energy savings for calculating and creating up to 10 years of VEECs at once. To determine the energy savings for future years from which VEECs can be created, a baseline energy model (before the project) and an operating energy model (from the operating period after the project) are compared once they are normalised;

Impacted Project means a Project where a State of Emergency, State of Disaster has had a material impact on one or more measurement boundaries used to calculate the reduction in greenhouse gases for that Project;

Implementation Start Time has the same meaning as in the VEET PBA Regulations;

Interactive savings means energy savings attributable to the upgrade that are outside the measurement boundary;

Measured energy consumption means the energy consumed by all products at a Premises that is measured within the measurement boundary;

Non-routine events are unexpected changes in energy use within the measurement boundary that result from changes that are not accounted for in the energy savings calculations and not related to the upgrade;

Premises has the same meaning as in the Victorian Energy Efficiency Target Act 2007;

Project means the prescribed activity, which is described in the applications for the scoping approval and project impact report, and project plan approval if required, as defined in the Victorian Energy Efficiency Target Project Based Activities Regulations 2017;

Site constant means a parameter of the measurement boundary that affects the energy consumed within the measurement boundary but does not vary under normal operating conditions;

State of Disaster has the same meaning as in the Emergency Management Act 1986;

State of Emergency has the same meaning as in the Public Health and Wellbeing Act 2008;

Upgrade means the change to equipment, controls, and/or behaviour, or the set of changes to equipment, controls, and/or behaviour as part of the Project.

2.2 General terms and requirements for all methods

2.2.1 Limits on forward creation

(1) A certificate cannot be created using a forward creation method for a prescribed activity if:

(a) creating the certificate would result in more than 50,000 certificates being created up front for the prescribed activity in a single project; or

(b) certificates have previously been created for the upgrade using annual creation; or

(c) certificates have previously been created for the prescribed activity for the same premises using forward creation three times.

(2) Maximum time period for forward creation:

(a) subject to (b) below, in relation to a Project, forward creation is permitted for ten years from the implementation start time of that Project; or

(b) in relation to an Impacted Project, forward creation of certificates is permitted for ten years from the commencement of the operating period.

2.2.2 Time at which prescribed activity is undertaken and reduction in greenhouse gas emissions occurs

(1) The project is taken to have been undertaken at the end of:

(a) for the purposes of creating certificates using a reduction in greenhouse gases calculated using a forward creation method — the operating period of the measurement boundary to complete works that was chronologically last to complete works; or

(b) for the purposes of creating certificates using a reduction in greenhouse gases calculated using an annual creation or top up — the reporting period of the measurement boundary to complete works.

(2) The reduction in greenhouse gas emissions that results from a project is taken to have occurred 6 months after the end of:

(a) for the purposes of creating certificates using a reduction in greenhouse gases calculated using forward creation method—the operating period of the measurement boundary to complete works; or

(b) for the purposes of creating certificates using a reduction in greenhouse gases calculated using an annual creation or top up method — the reporting period of the measurement boundary to complete works.

2.2.3 Application of Accounting for COVID-19 under VEU (2021)

(1) Any Project which is an Impacted Project and has an implementation start time during any of the following periods:

(a) up to 12 months prior to the start of any State of Emergency or State of Disaster;

(b) during the period of any State of Emergency or State of Disaster; and

(c) up to 3 years after the end of any State of Emergency or State of Disaster,

must apply *Accounting for COVID-19 under VEU (2021)* in conjunction with these Specifications.

(2) An application must be made for approval of a variation to a project plan or project impact report in respect of an Impacted Project.

(3) An application made under (7) must be supported by evidence (as set out in *Accounting for COVID-19 under VEU (2021)*) showing how and when the Impacted Project was impacted by the State or Emergency or State of Disaster or both.

(4) Any Project that has an implementation start time during any of the periods stated in (6) above but is not an Impacted Project must provide evidence showing that the Project is not an Impacted Project.

(5) Any project that has non-routine events may use the statistical methods prescribed in the 'mini-method' in *Accounting for COVID-19 under VEU (2021).*

2.2.4 Site constants

(1) Unless otherwise specified in the relevant method, each measurement boundary must have one or more site constants.

(2) A site constant is a parameter of the measurement boundary that affects the energy consumed within the measurement boundary but does not vary under normal operating conditions.

(3) For each site constant a standard value must be defined, which is the value the site constant is expected to have under normal operating conditions.

2.2.5 Time intervals

(1) The accredited person must nominate a measurement frequency for each measurement boundary.

(2) The length of a time interval is determined by the measurement frequency.

(3) The first time interval in a period must start at the start of the period, and each subsequent time interval in the period must start immediately after the previous time interval ends.

(4) The length of a time interval used to calculate electricity, gas or renewable energy savings may differ; however:

(a) time intervals used to calculate savings of the same energy source for the same measurement boundary must be of the same length; and

(b) time intervals for the baseline and reporting/operating periods of a measurement boundary must be of the same length;

(c) unless measurement frequency and hence time interval length is determined by utility data intervals.

(5) A time interval in a period is an eligible time interval if, with respect to that time interval:

(a) the period is a reporting period, values for the measured energy consumption have been obtained; and

(b) values for all independent variables have been obtained;

(c) the period is a reporting period, all site constants identified in a measurement boundary are at their standard values; and

(d) meets the requirements of the effective range.

2.2.6 Effective range

(1) The effective range referred to in 2.2.5 (5) is:

(a) if the time interval is in the reporting period – the range of values of the variable used to develop the baseline energy model; or

(b) if the time interval is in the normal year – the range of values that are in both:

i) the range of values of the variable used to develop the baseline energy model; and

ii) the range of values of the variable used to develop the operating energy model.

2.2.7 Reporting period

(1) Subject to 2.2.7 (2) the reporting period, in relation to a measurement boundary, is typically a 12-month period commencing:

(a) for a project with a single measurement boundary, immediately after the implementation start time;

(b) for a project with multiple measurement boundaries, immediately after the date that normal operations are capable of commencing within a measurement boundary after all changes to be implemented by the project within that measurement boundary are completed (this includes any testing and commissioning); or

(c) immediately after another reporting period but not later than 9 years after the implementation start time.

Note: This means there can be a maximum of 10 reporting periods, therefore if a project covers multiple measurement boundaries or multiple Premises with upgrades implemented at different times, the number of eligible reporting periods for some measurement boundaries or some Premises may be reduced.

(2) For an Impacted Project the periods referred to 2.2.7 (a), (b) and (c) may be extended in accordance with Accounting for COVID-19 Under VEU (2021).

2.2.8 Counted savings

(1) An adjustment may be made to counted savings in respect of upgrades prescribed by the Victorian Energy Efficiency Target Regulations 2018 if:

(a) for projects using the forward creation method, where the adjustment corrects for the proportion of eligible time intervals in the normal year;

(b) the adjustment corrects for the number of years that the savings coincide with the remaining eligible annual reporting periods; or

(c) the adjustment is required for compliance with Regulation 14(b) of the Victorian Energy Efficiency Target (Project-Based Activities) Regulations 2017[2].

2.2.9 Projects with multiple upgrades

(1) If the project includes undertaking essentially identical upgrades at a single premises, the measured energy consumption can be determined from measurements taken for a sample of the upgrades if:

(a) the measured energy consumption of each upgrade can be reasonably described by the same energy model;

(b) the sampling methods used produce a random sample; and

(c) the calculation of the relative precision used to determine the accuracy factor includes quantification of the impact of the sampling.

2.2.10 Measurement boundary

(1) The measurement boundary of an upgrade must include:

(a) all energy consuming products installed or removed, or modified in implementing the upgrade;

(b) all energy consuming products for which energy consumption is affected by the upgrade, unless 2.2.10 (2) applies;

(c) all energy generating products installed or removed in implementing the upgrade; and

(d) every product that is co-metered with energy consuming products referred to in 2.2.10 (1) (a), (b) or (c).

(2) An energy consuming product or a component of an energy consuming product may be excluded from the measurement boundary if:

(a) it is impractical or disproportionately costly to measure changes in the energy consumed by the product that result from implementation of the upgrade and the change in the energy consumed is minor or trivial;

(b) changes in the energy consumed by the product is accounted for in the interactive energy savings; or

(c) the method specifies alternative requirements for the measurement boundary.

(3) Measurement boundaries of similar upgrades in a Project must be determined in a consistent manner across all upgrades within a Premises and across all Premises within the Project.

(4) A Premises may have multiple measurement boundaries, provided there are no interactive effects between these boundaries.

2.2.11 Baseline energy model and operating energy model

(1) A baseline energy model or operating energy model is established by:

(a) A regression analysis that:

(i) is based on the values of the measured energy consumption within the measurement boundary and independent variables during the baseline period (for a baseline energy model) or operating period (for an operating energy model) where site constants are at their normal values; and

(ii) is based on at least 80% of the total number of time intervals in the baseline period (for a baseline energy model) or the operating period (for an operating energy model); and

[2] Regulation 14(b) provides that a certificate cannot be created where 'a certificate cannot be created in respect of a reduction in greenhouse gas emissions if a valid certificate has previously been created in respect of that reduction'

(iii) has at least six times as many independent observations of the independent variables as the number of independent variables in the energy model; or

(iv) has one less than at least six times as many independent observations of the independent variables as the number of independent variables in the energy model. Projects using this approach must reduce the Accuracy Factor by 0.1 and demonstrate that independent observations include peak consumption periods at a minimum; or

(v) for an Impacted Project, has the number of independent observations of the independent variables as required by Accounting for COVID-19 Under VEU (2021); or

(b) An estimate of the mean that:

(i) is based on the values of the measured energy consumption within the measurement boundary during the baseline period (for a baseline energy model) or operating period (for an operating energy model), where site constants are at their normal values and where the coefficient of variation of the measured energy consumption over the period is less than 15%; and

(ii) is based on at least 80% of the total number of time intervals in the baseline period (for a baseline energy model) or the operating period (for an operating energy model).

(2) The baseline period referred to in 2.2.11 (1):

(a) must not end more than 24 months, plus any further time allowances outlined in *Accounting for* COVID-19 Under VEU (2021), if applicable, before the day work for the purposes of the upgrade has commenced at the Premises; and

(b) must end before the day and time that work for the purposes of the upgrade has commenced at the premises, unless (3) applies.

(3) The baseline period may end after the day that work for the purposes of the upgrade has commenced at the premises if the effects of the upgrade can be temporarily suspended so that conditions prior to the upgrade being undertaken can be measured.

(4) The operating period referred to in 2.2.11 (1):

(a) for a project with a single measurement boundary, must not start before the implementation start time;

(b) for a project with multiple measurement boundaries, must not start before all normal operations are capable of commencing within that measurement boundary after all changes to be implemented by the project within that measurement boundary are completed (including testing and commissioning); and

(c) must end no later than two years, plus any further time allowances outlined in *Accounting for COVID-19 Under VEU (2021)*, if applicable, after the implementation start time.

2.2.12 Normal year

(1) A normal year is a set of values for a 12-month period for each independent variable used in the baseline energy model and the operating energy model.

(2) A value in a normal year must be provided for each time interval.

(3) A normal year must reasonably represent the expected mean, range and variation of the independent variables used in the baseline energy model and operating energy model in a typical year of the maximum time period for forward creation.

(4) Projects impacted by COVID-19 need not comply with the requirements for a normal year in this section. Further details on selecting a normal year for an Impacted Project are contained in *Accounting for COVID-19 Under VEU (2021)*.

2.2.13 Accuracy factor

(1) The method for determining the accuracy factor for the project is specified for each method.

(2) Accuracy factors are determined for each measurement boundary in a project with multiple measurement boundaries.

2.2.14 Interactive energy savings

(1) Each method will specify if interactive savings are allowed for. Where interactive savings are included in the method the following requirements apply.

(2) The total interactive energy savings for any model are limited to a maximum of:

(a) in a normal year, 10% of the difference between the energy consumption calculated using the baseline energy model and the energy consumption calculated using the operating energy model for eligible time intervals in the normal year, for all energy sources.

(b) in a reporting period, 10% of the difference between the energy consumption calculated using the baseline energy model and the measured energy consumption for eligible time intervals in the reporting period, for all energy sources.

(3) Interactive energy savings must be estimated in accordance with a repeatable method that:

(a) uses data recorded for the premises where the upgrade is undertaken; or

(b) is consistent with generally accepted estimation approaches in the science and engineering field applicable to the kind of effects being estimated.

(4) A consistent method must be used to estimate interactive energy savings in all calculations for the project.

2.2.15 Measured energy consumption

(1) Subject to (2), the measured energy consumption is the energy consumed by all products that is measured within the measurement boundary.

(2) For an Impacted Project the measured energy consumption may be calculated as set out in *Accounting for COVID-19 Under VEU (2021)*.

(3) If the project includes undertaking multiple essentially identical upgrades at different Premises, the measured energy consumption must be determined for each Premises.

(4) If the project includes undertaking multiple essentially identical upgrades at the same premises, the measured energy consumption can be determined from measurements taken for a sample of the upgrades if:

(a) the measured energy consumption of each upgrade can be reasonably described by the same energy model; and

(b) the sampling methods used produce a random sample; and

(c) the calculation of the relative precision used to determine the accuracy factor includes quantification of the impact of the sampling.

(5) Subject to 2.1 if the direct measurement of key parameters, used to determine the measured energy, cannot be reasonably achieved, alternative approaches may include;

(a) the use of third-party weather data to determine temperature parameters if;

(i) the data is from a reliable trusted source; and

(ii) the transient response of temperature effects is consistent with the parameter used to calculate energy

(b) an assumption of static parameter value if:

(i) the parameter is: calorific energy value, or pressure; and

(ii) assumptions for static values for parameters is supported by data; and

(iii) any errors are accounted for in the statistical tests in the energy model; and

(iv) the estimation of the parameter value used will result in the most conservative VEEC calculation.

3 Weather normalised whole of site electricity measurement (option C)

3.1 Information to be provided

3.1.1 Information to be provided in an application for scoping approval

(1) A declaration that the upgrade is eligible to use the weather normalised whole of site electricity measurement specified measurement method.

(2) A declaration that data sources suitable for the use of the whole of site electricity measurement (option C) with weather normalised method will be used. Specifically:

(a) electricity data collected from a utility billing meter at the premises;

(b) weather or temperature data from the Bureau of Meteorology or another reliable source measured in a location applicable for the premises; and

(c) optionally, if the premises has pre-existing solar PV, solar radiation data from the Bureau of Meteorology or another reliable source measured in a location applicable for the premises.

(3) A declaration that calculations or analysis have been performed to confirm that the project is suitable to use this specified measurement method, including:

(a) that the project is estimated to save equal to or greater than 10% of the metered electricity of the site or that the expected standard error of savings is less than half of the savings;

(b) The performance of the premises is weather dependent; and

(c) the prescribed activity is not the installation of rooftop solar or any other form of on-site electricity generation.

3.2 Methods

The carbon dioxide equivalent (in tonnes) of greenhouse gases to be reduced by undertaking a project is calculated using Equation 3.1, where variables are determined in accordance with section 2, this section and Accounting For COVID-19 Under VEU (2021) where applicable.

3.2.1 Carbon dioxide equivalent to be reduced

Equation 3.1

$$carbon\ dioxide\ equivalent = \sum_j \left(Savings_j \times EF_j \times RF_j \times AF_j \times PF_j\right) - counted\ savings$$

where:

(a) j is the measurement boundary number in the case that there are multiple measurement boundaries included in one project;

(b) $savings_j$ is the normal year savings calculated in MWh using Equation 3.2 for measurement boundary j;

(c) EF_j is the emissions factor for that measurement boundary;

(d) RF_j is the regional factor for that measurement boundary, which is 0.98 if the premises is in metropolitan Victoria or 1.04 if the premises is in regional Victoria, as defined in the Locations Variable List in the Victorian Energy Upgrades Specifications 2018;

(e) AF_j is the accuracy factor for the measurement boundary, being 1;

(f) PF_j is the persistence factor for that measurement boundary; and

(g) *counted savings* is a variable determined in accordance with section 2.

3.2.2 Normal year energy savings

Equation 3.2

$$normal\ year\ savings = \sum_t (E_{BM,t} - E_{OM,t})\ ERAF_t$$

where:

(a) t is an eligible time interval in the normal year of that measurement boundary;

(b) $E_{BM,t}$ is the energy consumption for t from the baseline model of that measurement boundary;

(c) $E_{OM,t}$ is the energy consumption for t from the operating model of that measurement boundary; and

(d) $ERAF_t$ is the eligible range adjustment factor for *t* from the operating model of that measurement boundary.

3.3 Variables

3.3.1 Measured energy savings

(1) For the purpose of this specified measurement method, the measurement boundary must align with the boundary of the electricity site meter(s) for the premises; and

(2) All other requirements for the measurement boundary also apply.

3.3.2 Accuracy factor

For the purpose of this specified measurement method, the accuracy factor is 1.

3.3.3 Normal year

(1) For the purpose of this specified measurement method, the normal year can be based on:

(a) historical weather data from the Bureau of Meteorology from the nearest suitable weather station to the premises, for the calendar year or financial year directly prior to the commencement of works; or

(b) a typical meteorological year of data for a suitable location.

3.3.4 Interactive energy savings

Given the Option C, whole of premises measurement approach, interactive savings are not accounted for in this specified measurement method – if the project has interactive savings greater than 1% of the energy for the measurement boundary an alternative method should be used.

3.3.5 Persistence factor

For the purpose of this specified measurement method, the persistence factor is 9.

4 Weather normalised whole of site gas measurement (option C)

4.1 Information to be provided

4.1.1 Information to be provided in an application for scoping approval

(1) A declaration that the upgrade is eligible to use the weather normalised whole of site gas measurement specified measurement method.

(2) A declaration that data sources suitable for the use the whole of site gas measurement (option C) with weather normalised method will be used. Specifically:

(a) gas data collected from a utility billing meter at the premises; and

(b) weather or temperature data from the Bureau of Meteorology or another reliable source measured in a location applicable for the premises.

(3) A declaration that calculations or analysis have been performed to confirm that the project is suitable to use this specified measurement method, including that the project is estimated to save equal to or greater than 10% of the metered gas of the site or that the expected standard error of savings is less than half of the savings.

4.2 Methods

The carbon dioxide equivalent (in tonnes) of greenhouse gases to be reduced by undertaking a project is calculated using Equation 4.1, where variables are determined in accordance with section 2, this section and Accounting For COVID-19 Under VEU (2021) where applicable.

4.2.1 Carbon dioxide equivalent to be reduced

Equation 4.1

$$carbon\ dioxide\ equivalent = \sum_j (Savings_j \times EF_j \times AF_j \times PF_j) - counted\ savings$$

where:

(a) j is the measurement boundary number in the case that there are multiple measurement boundaries included in one project;

(b) $savings_j$ is the normal year savings calculated in GJ using Equation 4.2 for measurement boundary j;

(c) EF_j is the emissions factor for that measurement boundary;

(d) AF_j is the accuracy factor for the measurement boundary, being 0.9;

(e) PF_j is the persistence factor for that measurement boundary; and

(f) *counted savings* is a variable determined in accordance with section 2.

4.2.2 Normal year energy savings

Equation 4.2

$$normal\ year\ savings = \sum_t (E_{BM,t} - E_{OM,t}) ERAF_t$$

where:

(a) t is an eligible time interval in the normal year of that measurement boundary;

(b) $E_{BM,t}$ is the energy consumption for t from the baseline model of that measurement boundary;

(c) $E_{OM,t}$ is the energy consumption for t from the operating model of that measurement boundary; and

(d) $ERAF_t$ is the eligible range adjustment factor for t from the operating model of that measurement boundary.

4.3 Variables

4.3.1 Measured energy savings

(1) For the purpose of this specified measurement method the measurement boundary must align with the boundary of the gas site meter(s) for the premises; and

(2) All other requirements for the measurement boundary also apply.

4.3.2 Accuracy factor

For the purpose of this specified measurement method, the accuracy factor is 0.9.

4.3.3 Normal year

(1) For the purpose of this specified measurement method, the independent variables for the normal year should be based on:

(a) historical weather data from the Bureau of Meteorology from the nearest suitable weather station to the premises, for the calendar year or financial year directly prior to the commencement of works; or

(b) a typical meteorological year of data for a suitable location.

4.3.4 Baseline and operating model

The requirements for the baseline and operating model listed in Section 2 and modified in the following ways for this specified measurement method:

(1) A baseline energy model is established by regression analysis that:

a) is based on the values of the measured energy consumption within the measurement boundary and independent variables during the baseline period where site constants are at their normal values; and

b) is based on at least 80% of the total number of time intervals in the baseline period (for a baseline energy model); and

c) has one less than at least six times as many independent observations of the independent variables as the number of independent variables in the energy model.

(2) The baseline period referred to in ((1):

a) must not end more than 36 months before the day work for the purposes of the upgrade has commenced at the Premises; and

b) must end before the day and time that work for the purposes of the upgrade has commenced at the premises.

(3) The operating model is established as per the directions in Part 2 of this document.

4.3.5 Interactive energy savings

This specified measurement method uses an Option C, whole of premises measurement approach, therefore interactive savings are not accounted for in this specified measurement method – if the project has interactive savings an alternative method should be used.

4.3.6 Persistence factor

For the purpose of this specified measurement method, the persistence factor is 9.

5 Retrofit isolation for non-seasonal motors and rotating equipment (option B)

5.1 Information to be provided

5.1.1 Information to be provided in an application for scoping approval

A declaration that the upgrade is eligible to use the retrofit isolation for non-seasonal motors and rotating equipment specified measurement method, and meets the following criteria:

(a) is not part of a system where the operation is materially impacted by seasonal changes, which may include rotating equipment installed as part of:

(i) heating, cooling, air-conditioning or ventilation (HVAC) systems;

(ii) cool room or refrigeration systems;

(iii) agricultural irrigation systems;

(iv) agricultural ventilation systems; or

(v) sites with a seasonal production cycle or a production cycle longer than 30 days.

(b) is part of a system where the operational cycle is 30 days or less, which may include rotating equipment installed as part of:

(i) car park ventilation systems;

(ii) food processing: drying, roasting, or packaging systems;

(iii) conveyor systems and material handling systems;

(iv) blower systems;

(v) air compressors;

(vi) grinding and crushing processes; or

(vii) elevators and escalators.

(c) for a project with more than one premises, the application for approval of a scoping plan must confirm that each premises is eligible to use this specified measurement method.

(2) Provide details of the proposed energy measurement approach, which may include:

(a) a device (or devices) which measures and logs true power (including power factor); or

(b) for an upgrade where the system being upgraded accounts for the majority of the energy metered by a meter, a utility meter or sub meter.

5.1.2 Information to be provided in an application for approval of a project impact report

(1) Evidence that the site meets the declarations indicated in 5.1;

(2) Evidence of operating hours if applicable;

(3) Evidence of independent variable, if applicable; and

(4) If using a utility meter, an energy bill and approval to access data from energy retailer.

5.2 Methods

The carbon dioxide equivalent (in tonnes) of greenhouse gases to be reduced by undertaking a project is calculated using Equation 5.1, where variables are determined in accordance with section 2, this section and Accounting For COVID-19 Under VEU (2021) where applicable.

5.2.1 Carbon dioxide equivalent to be reduced

Equation 5.1

$$carbon\ dioxide\ equivalent = \sum_j \left(Savings_j \times EF_j \times RF_j \times AF_j \times PF_j\right) - counted\ savings$$

where:

(a) j is the measurement boundary number in the case that there are multiple measurement boundaries under one project;

(b) *Savings* is calculated in MWh using Equation 5.2;

(c) *EF* is the emissions factor as defined in Section 2.1;

(d) *RF* is the regional factor, which is 0.98 if the premises is in metropolitan Victoria or 1.04 if the premises is in regional Victoria, as defined in the Locations Variable List in the Victorian Energy Upgrades Specifications 2018;

(e) AF is the accuracy factor for the measurement boundary, being the lowest number relevant from Table 5.1;

(f) $\mathrm{PF_j}$ is the persistence factor for that measurement boundary; and

(g) *counted savings* is a variable determined in accordance with section 2.

5.2.2 Normal year energy savings

Equation 5.2

$$savings = \sum_t (E_{BM,t} - E_{OM,t}) + E_{int}$$

where:

(a) t is an eligible time interval in the normal year of that measurement boundary;

(b) $E_{BM,t}$ is the energy consumption for t from the baseline model of that measurement boundary;

(c) $E_{OM,t}$ is the energy consumption for t from the operating model of that measurement boundary; and

(d) E_{int} is the total interactive energy savings of the measurement boundary in the normal year.

5.3 Variables

5.3.1 Measured energy savings

(1) The measurement boundary requirements of Section 2 apply in addition to the following:

(a) If a statistically valid sampling approach has been applied, the measurement boundary may apply only to the sample of the energy consuming requirements.

5.3.2 Accuracy factor and normal year

For the purpose of this specified measurement method, the accuracy factor for equation 5.1 is as per the relevant value in the right-hand slide column in Table 5.1.

Table 5.1

Operation	Model	Independent variable(s)	Normal year	Measurement precision	Accuracy factor
Continuous non-variable 24/7 operation	Estimate of the mean	None	Continuous non-variable 24/7 operation for 50 weeks per year	Utility meter	0.8
				Other measurement device	0.7
Continuous, non-variable operation during operating hour	Estimate of the mean for operating hours only or estimate of the mean for (a) operating hours and (b) non-operating hours.	• Default operating hours of 10 hours per day, 5 days per week, OR • Provide evidence of extended operating hours	Operating hours with a 2-week break over the first two weeks over January	Utility meter	0.8
				Other measurement device	0.7
Variable operation	Regression model	• Operating hours as above (if required) • Financial records on turnover or production, etc. • Other measured independent variable (other than heating degree days or weather dependent variable)	• Default operating hours with a 2-week break over the first two weeks over January, AND • 30 days of measured data repeated to cover a 12-month period	Utility meter and financial records	0.9
				Other energy measurement approach and financial records	0.8
				Other measurement approach for energy and independent variable	0.7
			Full 12-months of data	Utility meter and financial records	1.0
				Other measurement approach	0.8

5.3.3 Interactive energy savings

This specified measurement method does not allow for interactive energy savings.

5.3.4 Persistence factor for non-seasonal motors, fans and variable speed drives

Table 5.2

Technology	Persistence factor
Motors	9
Elevators and escalators	9
Pumps	9
Fans	8
Variable speed drives	8
Air compressor	7
Other	As determined in accordance with 8.3.4

6 Direct measurement of solar PV

6.1 Information to be provided

6.1.1 Information to be provided in an application for scoping approval

(1) A declaration that the upgrade is eligible to use the direct measurement of solar PV specified measurement method; and

(2) A document which specifies the following:

(a) details of any existing solar PV or electricity generating equipment at the premises; and

(b) the standards to be applied for the solar PV equipment; and

(3) The measurement approach should not capture spilled energy that is generated by the solar PV system that is not utilised or exported.

6.2 Methods

6.2.1 Carbon dioxide equivalent savings

The carbon dioxide equivalent (in tonnes) of greenhouse gases to be reduced by undertaking a project is calculated using Equation 6.1, where variables are determined in accordance with section 2 and this section.

Equation 6.1

$$carbon\ dioxide\ equivalent = \sum_j (Savings_j \times EF_j \times RF_j \times AF_j \times PF_j) - counted\ savings$$

where:

(a) j is the measurement boundary number in the case that there are multiple measurement boundaries under one project;

(b) *savings* is calculated in MWh using Equation 6.2;

(c) *EF* is the emissions factor, as per the definition in section 2;

(d) *RF* is the regional factor, which is 0.98 if the premises is in metropolitan Victoria or 1.04 if the premises is in regional Victoria, as defined in the Locations Variable List in the Victorian Energy Upgrades Specifications 2018;

(e) AF is the accuracy factor for the measurement boundary, being 1;

(f) $\mathrm{PF_j}$ is the persistence factor for that measurement boundary, being the applicable number from Table 6.2; and

(g) *counted savings* is a variable determined in accordance with section 2.

6.2.2 Annual energy savings

Equation 6.2

$$savings = \sum_t (E_{S,t} - E_{Ex,t} - E_{ES,t})$$

where:

(a) t is an eligible time interval of that measurement boundary;

(b) $E_{S,t}$ is the energy generated by all renewable energy systems at the premises for time interval t for that measurement boundary;

(c) $E_{Ex,t}$ is the energy generated by the solar PV system that is exported to the electricity grid for time interval t for that measurement boundary. This should not include energy used to charge batteries or other energy storage systems; and

(d) $E_{ES,t}$ means the energy generated by any existing renewable energy systems at the premises for time interval t for that measurement boundary.

6.3 Variables

6.3.1 Measured energy savings

For this specified measurement method the following requirements apply for the measurement boundary:

(1) The measurement boundary must align with the boundary of the electricity meter(s) for the premises;

(2) Where a premises has more than one meter the data can be combined; and

(3) All other requirements for the measurement boundary also apply.

6.3.2 Accuracy factor

For the purpose of this specified measurement method, the accuracy factor is 1.

6.3.3 Interactive energy savings

This specified measurement method does not allow for interactive energy savings to be included.

6.3.4 Persistence factor for solar and batteries

Table 6.2

Technology	Persistence factor
Solar PV panels and inverters with CEC accreditation	9
Solar PV panels, inverters and batteries with CEC accreditation	8

7 Electrification direct measurement

7.1 Information to be provided

7.1.1 Information to be provided in an application for scoping approval

(1) A declaration that the project is eligible to use the electrification direct measurement specified measurement method, and meets the following criteria:

(a) involves the installation of an electric heat pump to replace gas-fired equipment;

(b) includes data sources suitable for the electrification direct measurement method that will be used, including the following:

(i) measurement of the thermal energy that may include volume and temperature for the installed equipment, and pressure for pressurised systems; and

(ii) electricity data collected from a meter at the premises; and

(2) Evidence that calculations or analysis have been performed to confirm that the project is suitable to use this specified measurement method, including that the activity is estimated to save more than 10% of the metered gas of the site.

7.2 Methods

7.2.1 Calculation of carbon dioxide equivalents of greenhouse gases

The carbon dioxide equivalent (in tonnes) of greenhouse gases to be reduced by undertaking a project is calculated using Equation 1, where variables are determined in accordance with section 2, this section and Accounting For COVID-19 Under VEU (2021) where applicable.

7.2.2 Carbon dioxide equivalent to be reduced

Equation 7.1

$$carbon\ dioxide\ equivalent = \sum_j (\ avoided\ emissions_j \times PF_j \times AF_j) - \text{counted savings}$$

where:

(a) j is the measurement boundary number in the case that there are multiple measurement boundaries under one project;

(b) $avoided\ emissions$ is the calculated as per equation 7.2;

(c) *PF* is the persistence factor as provided for in Table 7.2;

(d) AF is the accuracy factor for the measurement boundary; and

(e) *counted savings* is a variable determined in accordance with section 2.

7.2.3 Direct measurement savings

Equation 7.2

$$Avoided\ emissions = \sum_t \left(E_{B,t} \times \frac{1}{B} \times EF_{gas} - E_{meas,t} \times EF_{elec} \right)$$

where:

(a) t is an eligible time interval in the operating period of that measurement boundary;

(b) $E_{B,t}$ is the heat energy measured in GJ for time interval *t* at that measurement boundary;

(c) B is the boiler efficiency factor from Table 7.3;

(d) $E_{meas,t}$ is the measured electricity consumption in kWh for time interval *t* at that measurement boundary; and

(e) *EF* is the emissions factor as defined in Section 2.1

7.2.4 Accuracy factor

For the purpose of this specified measurement method, the accuracy factor is the relevant value in the right-hand slide column in Table 7.1 below.

Table 7.1

Length of operating period	Accuracy factor
Between 6 and 12 months, including the peak, shoulder and off season	0.7
Equal to or greater than 12 months	0.8

7.2.5 Interactive energy savings

Interactive energy savings are limited to 10% for this specified measurement method.

7.2.6 Persistence factor

The persistence factor for a year is assigned on a per measurement boundary basis and is determined using Table 7.2.

Table 7.2

Technology	Persistence factor
Heat pump hot water system	9

7.2.7 Boiler efficiency factor

Table 7.3

Type of appliance	Efficiency factor	Source
A gas water heater, that is used as part of an air conditioning system and is rated to consume 500MJ/hour or less	0.86	NCC Volume 2 Part J6D10 (4)
A gas water heater, that is used as part of an air conditioning system and is rated to consume more than 500MJ/hour	0.9	NCC Volume 2 Part J6D10 (4)
Swimming pool or spa gas heater rated to consume 500MJ/hour or less	0.86	NCC Volume 2 Part J8D3 (1)(d)
Swimming pool or spa gas heater rated to consume more than 500MJ/hour	0.9	NCC Volume 2 Part J8D3 (1)(d)
Any other gas appliance	0.9	-

8 Measurement and Verification

8.1 Information to be provided

8.1.1 Information to be provided in an application for scoping approval

(1) In a project with more than one premises, the application for approval of a scoping plan must describe the similarity of premises and upgrade, including:

(a) that the service(s) affected by the upgrade are consistent for each premises; and

(b) that energy sources affected by the upgrade are consistent for each premises.

Note: Under (6)(4) in the Project Based Activities Regulations the ESC may refuse a scoping approval. The ESC may utilise this power if upgrades are not essentially identical across all premises under a Project.

8.1.2 Information to be provided in an application for approval of a project plan

(1) The application for approval of a project plan must identify one of the following methods for each measurement boundary intended to be used to calculate the reduction in greenhouse gases:

(a) forward projection of savings using a baseline energy model and operating energy model;

(b) annual reporting of savings using a baseline energy model and measured energy consumption; or

(c) a combination of (a) and (b) comprising a forward projection followed by annual reporting of savings ('top-up').

(2) Projects with multiple essentially identical upgrades occurring at multiple premises must:

(a) choose a method listed in 8.1.2 (1) consistently across all premises for calculating reduction in greenhouse gases at all premises; and

(b) describe the degree to which the proposed measurement boundaries are consistent for each premises.

(3) An application for approval of a project plan for an Impacted Project should set out how *Accounting for COVID-19 Under VEU (2021)* will or is expected to be applied (if known at the time the application is submitted).

8.1.3 Information to be provided in an application for approval of a project impact report

(1) The application for approval of a project impact report must include the following:

(a) details of the measurement boundary(ies);

(b) site constants and their standard values;

(c) a calculation of the carbon dioxide equivalent to be reduced using Equation 8.1;

(d) emissions factors used in abatement calculations;

(e) details of any counted savings;

(f) the baseline energy model(s) in equation form;
Note: Projects with multiple measurement boundaries will require multiple baseline energy models, the dates these baseline periods cover may differ.

(g) a declaration of whether the Project is an Impacted Project for the purposes of applying *Accounting for COVID-19 under VEU (2021)*, and evidence to support this declaration;

(h) the accuracy factor(s), eligible range adjustment factor(s), and bias adjustment factor(s), if relevant;

(i) for projects using the forward creation method:

(i) the operating energy model(s) in equation form;

(ii) a normal year for each independent variable, if relevant;

(iii) interactive energy savings for each normal year;

(iv) the decay factor(s) for each year of the forward creation period;

(v) calculations of energy savings using Equation 8.2;

(vi) calculations of normal year savings using Equation 8.4;

(j) for projects using the annual creation or top up method:

(i) measured energy consumption data for the reporting period(s);

(ii) measured values for the reporting period(s) for each independent variable, if relevant;

(iii) interactive energy savings for the reporting period(s);

(iv) previous energy savings calculated using Equation 8.3 for any previous reporting periods, including any negative energy savings;

(v) calculations of energy savings using Equation 8.3;

(vi) calculations of measured annual savings using Equation 8.5;

(k) evidence that energy models comply with the statistical requirements;

(l) evidence that time intervals used to calculate energy savings are eligible time intervals; and

(m) written justification of the steps and decisions taken in completing the calculations for each type of model.

Note: Projects introducing multiple essentially identical upgrades may use the same independent variable(s) and equation structure with the same reasoning and decisions in model development.

8.2 Methods

8.2.1 Calculation of carbon dioxide equivalents of greenhouse gases

(1) The carbon dioxide equivalent (in tonnes) of greenhouse gases to be reduced by undertaking a project is calculated using Equation 1, where variables are determined in accordance with 2.2.5 and 2.2.10 and, where applicable, Accounting For COVID-19 Under VEU (2021).

8.2.2 Carbon dioxide equivalent to be reduced

Equation 8.1

$$carbon\ dioxide\ equivalent = \sum_j (\ electricity\ savings_j \times electricity\ emissions\ factor_j\ \times\ RF_j) + \sum_j (\ gas\ savings_j \times gas\ emissions\ factor_j\ ) + \sum_j (\ renewable\ energy\ savings_j \times renewable\ emissions\ factor_j\ ) - \sum_j (\ counted\ savings_j)$$

where:

(a) j is the measurement boundary number in the case that there are multiple measurement boundaries under one project;

(b) *electricity savings* is calculated in MWh using Equation 8.2 or 8.3, taking references to “energy” in Equations 8.2 to 8.5 of this Division to mean “electricity”;

(c) *RF* is the regional factor, which is 0.98 if the premises is in metropolitan Victoria or 1.04 if the premises is in regional Victoria, as defined in the Locations Variable List in the Victorian Energy Upgrades Specifications 2018;

gas savings is calculated in GJ using Equation 8.2 or 8.3, taking references to "energy" in Equations 8.2 to 8.5 of this Division to mean "gas";

(d) *renewable energy savings* is calculated using Equation 8.2 or 8.3, taking references to "energy" in Equations 8.2 to 8.5 of this Division to mean "renewable energy";

(e) *counted savings* is a variable determined in accordance with 2.2.8; and

(f) *emissions factors* are provided in section 2.1.

8.2.3 Energy savings using forward creation method

Equation 8.2

$$energy\ savings = \sum_i (normal\ year\ savings \times (AF \times DF_i \times BAF)^{\frac{normal\ year\ savings}{|normal\ year\ savings|}})$$

where:

(a) i is a year of the maximum time period for forward creation for the project;

(b) *normal year savings* is calculated using Equation 8.4;

(c) AF is the accuracy factor for the measurement boundary;

(d) $\mathrm{DF_i}$ is the decay factor for that measurement boundary in year i; and

(e) BAF is the bias adjustment factor for the measurement boundary (if any).

8.2.4 Energy savings using annual creation or top up method

Equation 8.3

$$energy\ savings = measured\ annual\ energy\ savings \times (AF \times BAF)^{\frac{measured\ annual\ energy\ \ savings}{|measured\ annual\ energy\ savings|}} \pm previous\ energy\ savings$$

where:

(a) *measured annual energy savings* is calculated per measurement boundary using Equation 8.5;

(b) *AF* is the accuracy factor for the measurement boundary determined using Table 8.1, where the "relative precision" means the relative precision of the measured savings at 90% confidence level;

(c) *BAF* is the bias adjustment factor for the measurement boundary (if any); and

(d) *previous energy savings* is the total amount of energy savings calculated using this equation for the previous reporting period of that measurement boundary (if any), including negative energy savings (if any).

8.2.5 Normal year energy savings

Equation 8.4

$$normal\ year\ savings = \sum_t (E_{BM,t} - E_{OM,t}) ERAF_t + E_{int}$$

where:

(a) t is an eligible time interval in the normal year of that measurement boundary;

(b) $E_{BM,t}$ is the energy consumption for t from the baseline model of that measurement boundary;

(c) $E_{OM,t}$ is the energy consumption for t from the operating model of that measurement boundary;

(d) $ERAF_t$ is the eligible range adjustment factor for *t* from the operating model of that measurement boundary; and

(e) E_{int} is the total interactive energy savings of the measurement boundary in the normal year.

8.2.6 Measured annual energy savings

Equation 8.5

$$measured\ annual\ energy\ savings = \sum_t \left(E_{BM,t} - E_{meas,t}\right) + E_{int}$$

where:

(a) t is an eligible time interval in the reporting period of that measurement boundary;

(b) $E_{BM,t}$ is the energy consumption for *t* from the baseline model of that measurement boundary;

(c) $E_{meas,t}$ is the measured energy consumption for *t* at that measurement boundary; and

(d) E_{int} is the total interactive energy savings of the measurement boundary in the reporting period.

8.3 Variables

8.3.1 Measurement boundary

The measurement boundary must comply with the requirements in section 2.

8.3.2 Baseline and operating model

(1) The baseline and operating model must comply with the requirements in section 2; and

(2) The baseline and operating periods must comply with the requirements in section 2.

8.3.3 Accuracy factor

(1) The accuracy factor is determined using Table 8.1, where the “relative precision” means the relative precision of the normal year savings at 90% confidence level.

Table 8.1

Relative precision	Accuracy factor if an energy model is developed using an estimate of the mean	Accuracy factor if all energy models are developed using regression analysis
< 25%	0.9	1
25% to < 50%	0.8	0.9
50% to < 75%	0.7	0.8
75% to < 100%	0.5	0.6
100% to < 150%	0.3	0.4

150% to < 200%	0.1	0.2
>=200%	0	0

8.3.4 Decay factor

(1) The decay factor for a year is assigned on a per measurement boundary basis and is determined using Table 8.2 or by applying a persistence model;

(2) A persistence model must meet the following requirements:

(a) it provides a reasonable estimate of the expected lifetime of an energy consuming product in whole years; and

(b) it provides a decay factor representing the decline in performance of the product each year by taking into account:

(iii) the type of the energy consuming product; and

(iv) how the energy consuming product is used; and

(v) the environmental characteristics of the premises where the energy consuming product is used; and

(c) the model provides the most conservative set of yearly decay factors when applied to more than one energy consuming product or the model provides the yearly decay factors for the energy consuming product that contributes to greater than 80% of the total annual energy savings.

Table 8.2

Year (*i*)	Decay factor
1	1.00
2	0.80
3	0.64
4	0.51
5	0.41
6	0.33
7	0.26
8	0.21
9	0.17
10	0.13