



The New Zealand Emissions Trading Scheme:

MODELLING THE ELECTRICITY ALLOCATION FACTOR

Issues paper



Ministry for the
Environment
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1. About this issues paper

This issues paper seeks comments from stakeholders to support modelling of the electricity allocation factor (EAF).

The EAF is an estimate of the future impact of the New Zealand Emissions Trading Scheme (NZ ETS) on wholesale electricity prices passed through to consumers. Its expression is tonnes of carbon dioxide equivalent per megawatt hour (tCO₂e/MWh). It is part of the rates of allocation prescribed to industries considered 'emissions intensive and trade exposed'.

The 2011 review of the EAF resulted in an EAF value of 0.537 tCO₂e/MWh. Several key variables have changed from what was assumed during that modelling, and a re-assessment is warranted.

We are seeking comments on specific modelling inputs and techniques. The outputs of modelling will be discussed at workshops in early 2020, and potentially lead to the amendment of allocative baselines in the Climate Change (Eligible Industrial Activities) Regulations 2010 during that year.

All other elements of industrial allocation under the NZ ETS are outside the scope of this issues paper. These include the calculation of emissions from sources other than electricity in allocative baselines, the eligibility of any industrial activity and rates of assistance, and allocation to agricultural activities. This issues paper is only concerned with the inputs and techniques for modelling the future impact of the NZ ETS on electricity prices.

2. Background

The electricity allocation factor (EAF) is an estimate of the degree that future emissions costs from electricity generation are assumed to pass through the wholesale electricity market to consumers. It is currently set at 0.537 tCO₂e/MWh. This value has been in place since 2013.

The EAF is not an estimate of the emissions intensity of electricity generation. Average electricity sector emissions do not drive NZ ETS electricity price pass through impacts, because under the wholesale electricity market electricity prices are set by the marginal station needed to meet demand each half hour. This station is most likely to be fossil fuelled, or, if renewable, the bid is usually relative to a thermal generator. All generators with bids below that marginal station will receive the same price for that period.

An emissions cost increases the variable (or short-run) costs of all generating stations that are greenhouse gas emitters. In a competitive market, all such emitting stations will attempt to increase the price of their offers into the spot market to recover that cost. If one of these emitting stations is the marginal plant called to operate in any given half hour, then that offer price will be the price for the whole market for that half hour (ie, non-emitting stations will also receive this price).

The EAF is important for industrial users that receive free allocations of emission units because it drives the electricity use component of their allocative baselines. An allocative baseline (emissions per unit of output) is at the core of the units allocated to eligible activities and is a measure of the emissions intensity of that activity. An allocative baseline reflects indirect emissions from using electricity (through the EAF) as well as emissions from direct consumption of coal and gas and other sources.

The EAF resulted in about a third of the 5.4 million units allocated in 2018 to eligible industrial activities (excluding aluminium smelting) being attributable to electricity use.¹

The EAF is given effect by regulation 6(a) of the Climate Change (Eligible Industrial Activities) Regulations 2010 and through the Schedule to those regulations which contain the allocative baselines and assistance rates for eligible activities. Twenty-six eligible industrial activities are listed in regulations, some with more than one allocative baseline.

An EAF was first developed in 2009 and was included in Cabinet decisions on industrial allocation levels in 2010. Stakeholders then identified issues with some of the modelling inputs and that initial EAF, of 0.52 tCO₂e/MWh, was reviewed.

The 2011/12 review of the EAF was helped by a contact group of affected parties, officials and persons with industry and technical knowledge. The modelling that informed that review used standard electricity system models alongside complementary techniques and some assumptions. The core technique was a combination of a long-run marginal cost model to determine new generation build mix, and a short-run marginal cost model to simulate the operation of the electricity system.

The EAF was intended to be durable, reflecting the best available knowledge of future fuel and carbon prices and policies, generator plant changes, and market structure changes. The

¹ The allocative baseline for aluminium smelting contains a unique EAF due to very large and long electricity contracts.

contact group recommended that the EAF remain in place until significant events occur making the analysis obsolete. The importance of certainty for firms making long-term investments was cited as the key reason for an ‘as required’ approach to review of the EAF.

The Ministry has procured and published two review reports on the current EAF value. The first estimated the actual EAF in the wholesale electricity market over 2016 and 2017 using actual and counterfactual (no NZ ETS costs) electricity market spot prices.² Three scenarios were tested and the results are shown in table 1.

Table 1: Electricity allocation factor values 2016/17

Scenario explanation	Modelled EAF (tCO ₂ e/MWh)
NZ ETS costs have affected thermal generation bids only	0.1 (low bound)
NZ ETS costs have also affected hydro-generators who have increased spot market offers due to the value of stored water	0.48 (high bound)
NZ ETS costs have also decreased the quantity of thermal generation offered into the market	0.42

The modelled EAFs are all lower than the current EAF of 0.537 tCO₂e/MWh. It is important to note that:

- A direct comparison of the modelled EAF values with the current value is not appropriate. The current value spans an extended horizon covering periods of reduced and increased thermal generation as generation build evolved over time.
- There were significant changes in the electricity market over 2016-17 that may have affected the results, including the addition of base load geothermal and wind generation together with expansion of the transmission system.

The second report compared input values used in 2011 for the modelled scenarios against actual input values.³ In other words, it compared predictions with what happened. The report concluded that:

- the price of emission units was, until 2016, lower than assumed in the comparative scenarios
- gas has been consistently cheaper than the assumed \$7.28/GJ
- coal has, on average, been more expensive than the assumed \$4.50/GJ
- Huntly units 1 and 2 were retired earlier than expected in the modelling assumptions
- electricity demand has been almost flat, such that total demand is lower than assumed in any EAF modelling scenario
- 555 MW of large fossil fuel generation went offline during the 2013-17 period, and this was not modelled
- Huntly Rankine station has burnt 25 per cent gas and 75 per cent coal, instead of 100 per cent coal.

The report concluded that had actual values been used rather than the assumed values used in the 2011 model runs, the estimated EAF would have been lower than 0.537 tCO₂/MWh.

² Scientia Consulting. 2018. *Electricity Allocation Factor Estimates for 2016/17*. Ministry for the Environment.

³ Concept Consulting Group. 2019. *Electricity Allocation Factor Assumptions Review*; Ministry for the Environment.

3. Review assumptions

This issues paper seeks submissions on the assumptions and techniques for re-modelling the EAF. To help this engagement, the Ministry procured a report on possible values.⁴ A summary of the report recommendations is in table 2 below. Submitters are strongly encouraged to consider the full analysis of each point, as well as supplementary details, as found in the consultant's report.

Table 2: Recommended modelling parameters and values

Parameter	Recommended values
Demand	0.3%, 0.5%, 0.8% per annum
Carbon	Rising linearly to \$50 by 2035, along with a low and a high scenario, as per Productivity Commission
Gas	Disclosed prices plus PPI where appropriate
Coal	Indonesian coal price forecast for the correct coal, plus domestic transport costs
HVDC charges	Phase out over the next few years
Solar	Value of behind-the-meter solar is the relevant forecast daytime spot price
Wind farm offers	Newer wind farms \$5/MWh through to the oldest wind farms at \$20/MWh
Genesis-Meridian swaption	Renewed in 2023
Tiwai Pt smelter	Operates at its current normal operational load unless turned down during an extreme dry year
Retirements	All plant remains in the market at current capacity
Inflows	Market modelling includes all historical inflows available back to around 1930
River chains and lakes	Water values consistent with market
Wind profiles	Moderate accuracy in terms of correlations between wind farms, high accuracy not required
Solar profiles	Basic solar output profile for behind-the-meter solar
Demand profiles	Detailed enough to capture peak, off-peak dynamics within each week of the year
Time resolution	High resolution may be useful, eg, particularly for finalising scenarios, but is not considered essential provided the demand profile shape is captured at the required minimum level
Demand response	Demand response would capture the likely response during an official conservation campaign and also the possibility of Tiwai load being reduced when storage falls below trigger levels in the Meridian-Tiwai hedge agreement
Outages	Known outages and expected planned outages of major plant to be modelled
Transmission grid	If decided, sufficient detail is required in the grid model to allow the impact of marginal losses on the EAF to be assessed accurately
Inflation	PPI 2% per annum

⁴ EnergyLink. 2019. *Electricity Allocation Factor Review Background Information*. Ministry for the Environment.

Parameter	Recommended values
Wind LCOEs	Calibrate to actual market data and deflate by 0.5% per annum in real terms
Solar LCOEs	Calibrate to actual market data and deflate by 4.5% per annum in real terms
Review period	Review the EAF at least every five years and preferably every three years.

4. Questions to guide your feedback

1. Which modelling parameters and values do you agree with? Why?
2. Which modelling parameters and values do you not agree with? Why?
3. Are there modelling parameters and values that are missing? What are they?
4. When should the EAF be reviewed?
5. Are you interested in attending a workshop in February 2020 on the electricity market modelling of the EAF?

5. Process for the review

The Ministry will procure electricity market modelling in early 2020 following our review of submissions on this issues paper. We will invite submitters to workshops on the results of modelling to help us decide on the preferred new EAF value. Should this value indicate a case for policy change, this will be publicly consulted on before policy decisions. The full timeline is provided in table 3 below.

Table 3: Indicative timeframes

Key step	Indicative dates
Publish issues paper	20 November 2019
Submissions due	20 December 2019
Modelling results workshops	By end of February 2020
Publish NZ ETS regulation updates discussion document	By 1 May 2020
Updated allocative baselines in force	1 January 2021

6. How to make a submission

The Government welcomes your feedback on this issues paper. A list of all the questions is in [section 4](#). They are a guide only. You do not have to answer them all, and all comments are welcome.

To ensure we understand your point of view, please explain your rationale and give supporting evidence if needed.

You can make a submission in two ways:

- Use our online submission tool, available on our website at <https://www.mfe.govt.nz/consultations/nzets-electricity-allocation-factor-review>. We prefer to receive submissions this way.
- Write your own submission.

If you are posting your submission, send it to Electricity Allocation Factor Review, Ministry for the Environment, PO Box 10362, Wellington 6143 and include:

- title of this consultation (Electricity Allocation Factor Review)
- your name or name of the organisation you represent
- postal address
- email address.

If you are emailing your submission, send it to EAFreview@mfe.govt.nz as a:

- PDF
- Microsoft Word document (2003 or later version).

Submissions close at 5.00 pm on Friday 20 December 2019.

Contact for queries

Phone: +64 4 439 7400

Email: EAFreview@mfe.govt.nz

Post: Electricity Allocation Factor Review, Ministry for the Environment, PO Box 10362, Wellington 6143

Publishing and releasing submissions

All or part of any written submission the Ministry for the Environment received electronically or in printed form, including your name, may be published on our website, www.mfe.govt.nz. Unless you clearly specify otherwise in your submission, we will consider that you have consented to website posting of both your submission and your name.

Submissions may also be released to the public under the Official Information Act 1982 following requests to the Ministry for the Environment (including by email). Please advise if you object to the release of any information contained in your submission and, in particular,

which part(s) you consider should be withheld, together with the reason(s) for withholding the information.

Any personal information you supply to us when making a submission will only be used by us in relation to the consultation covered in this document. You have the right to request access to or to correct any personal information you supply to us.

If you have any questions about the publishing and releasing of submissions, or if you would like to access or correct any personal information you have supplied, please email info@mfe.govt.nz.

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Concept Consulting Group. 2019. *Electricity Allocation Factor Assumptions Review*; Ministry for the Environment.

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