

APPENDIX C: CALCULATING THERMAL SHORT-RUN MARGINAL COSTS

The Electricity Authority's monitoring team estimates the short run marginal costs (SRMC) for generators as part of our approach to compare economic costs to the spot price in the [weekly trading conduct reports](#). The following steps describe the calculation of the coal, gas and diesel short-run marginal costs. Note that these calculations exclude the opportunity costs of storage and start up costs..

1. Short-run marginal cost calculations

- 1.1. Historical series of the spot gas price, coal price, diesel price and carbon price are obtained from the following sources:
 - a. **Gas price** (daily volume weighted average market price): [emsTradepoint - ETP](#) data. Note - zero values indicate no trade on that day. We replace the zero values with the market price from the most recent day on which trades occurred.
 - b. **Coal price:** We use the HBA series from [COALspot: Coal Index, Coal News, Shipping](#). This is a benchmark price in \$US/tonne. We make the following adjustments (on advice from Enerlytica):
 - Multiply the benchmark price by 0.76 to account for the coal specification that Genesis imports.
 - Add US\$15/tonne (NZ\$10.50/MWh) for International Insurance and Freight for transporting the coal to the New Zealand port.
 - Apply the US\$ to NZ\$ exchange rate from [New Zealand's central bank - Reserve Bank of New Zealand - Te Pūtea Matua \(rbnz.govt.nz\)](#) to convert in to \$NZ/tonne.
 - Add NZ\$20/tonne (NZ\$9.90/MWh) domestic freight for transporting the coal from the port to Huntly.
 - Apply a heat value of 22 GJ/tonne to convert to NZ\$/GJ. (source: [Energy Sector Research | Enerlytica](#) 'NZ Energy Daily': 1,000 times the ratio of the Huntly coal stockpile in PJ and kt).
 - c. **Diesel price:** We use the diesel price series from [Weekly fuel price monitoring | Ministry of Business, Innovation & Employment \(mbie.govt.nz\)](#). We add a delivery cost to Whirinaki of 10 cents per litre and apply a factor of 37.1 MJ/litre to convert to \$/GJ (source: [2020 Thermal generation stack update report \(mbie.govt.nz\)](#) section 3.1.13.4).
 - d. **Carbon price (NZU):**
 - up to 23/2/2021: 'NZ ETS' series from [Allowance Price Explorer | International Carbon Action Partnership \(icapcarbonaction.com\)](#).
 - From 24/2/2021 onwards: [emsTradepoint - ETP](#) (daily volume weighted average market price) data.
 - 1.2. The coal and exchange rate series are monthly, so we convert the other series to monthly averages for consistency.
 - 1.3. We use interpolation to fill any gaps in the data.
 - 1.4. The following parameters are also used to convert the fuel and carbon prices to an SRMC for each station:
- Appendix C: Electricity Authority's the [trading conduct weekly reports](#)

- a. fuel type (gas, coal, diesel).
- b. heat rate (HR) (GJ/MWh) (source: Table 3-13 of [2020 Thermal generation stack update report \(mbie.govt.nz\)](#))
- c. emission factor (EF) (tonnes CO₂ per TJ) (source: Tables A4.1 (gas = 'Weighted Average' and diesel = 'Diesel (10 parts (sulphur) per million)') and A4.2 (coal = latest value (2018)) of [New Zealand's Greenhouse Gas Inventory 1990-2018 | Ministry for the Environment](#))
- d. variable operation and maintenance costs (VOM) (\$/MWh) (source: Table 3-15 of [2020 Thermal generation stack update report \(mbie.govt.nz\)](#)).

1.5. For each station, we calculated the SRMC as:

$$VOM + HR * (fuel_cost + \frac{EF}{1000} carbon_price)$$

where:

- SRMC is a series in \$/MWh.
- *fuel_cost* is the price series for the relevant fuel type in \$/GJ.
- *carbon_price* is the price series in \$/tonne of CO₂ (only added for coal and diesel since the gas spot price already includes the carbon price)
- VOM, HR, EF as above.