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 Enerlytica's calculation of the all-inclusive delivered price at Huntly in $NZ/GJ (excluding carbon). This is the sum of the components in the "Import cost componentry excl carbon, NZ$/GJ" graph in their "NZ Coal" publication, which they publish approximately monthly. Numerical values for the latest month are shown in the "Latest month import cost componentry, NZ$/GJ" graph in the same publication.[1]

   c. **Diesel price:** We use the "Diesel_price_excl_taxes_NZc.p.l" 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.   Since the coal series is monthly, we convert the other series to monthly averages for consistency and also to reduce volatility.

1.3.   We use interpolation to fill any gaps in the data.

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[1] We used to calculate the cost build-up ourselves based on the HBA marker price, on which Indonesian royalties were based. However, this had been over-estimating prices received by Indonesian coal miners since shortly after Russia invaded Ukraine in February 2022. This was because Australian coal prices, which made up about half of the HBA index, were affected by the war and sanctions much more than Indonesian prices. As a result, the Indonesian government changed how the indices were calculated, making extracting the relevant coal price for Huntly more complicated. Enerlytica also moved to a more accurate dynamic estimate of international and domestic freight costs (see NZ Coal - Initiation Report), so rather than trying to replicate this we now just use their cost estimate.

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1.4. The following parameters are also used to convert the fuel and carbon prices to an SRMC for each station:

    a. fuel type (gas, coal, diesel).

    b. heat rate (HR) (GJ/MWh), sources as follows:

- For the Stratford peakers, Contact Energy supplied a value of 10.92, which is the mean heat rate over 2021-2024. Contact advised that the value from the following source was not achievable.

- For everything else, Table 3-13 of 2020 Thermal generation stack update report (mbie.govt.nz))

    c. emission factor (EF) (tonnes CO_2 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 CO_2 (only added for coal and diesel since the gas spot price already includes the carbon price)
- VOM, HR, EF as above.

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