Thermal Fuel Assumptions in the HRCs

Introduction

As mentioned in part 1 of the HRCs 101 series, thermal fuel assumptions are a major part of the Hydro Risk Curve (HRC) model. This is largely driven by the defined standard set out in the Transpower’s Security of Supply Forecasting and Information Policy: “[The hydro risk curves must] assume market behaviour that seeks to minimise the use of hydro storage”.

This standard is incorporated into the model as an assumption that thermal generation will always run at 100% of planned available capacity. While this assumption does not reflect normal market operation, it becomes more valid as hydro storage declines to an emergency situation level. As a result, the produced HRCs are a more accurate indication of normal market operation in an emergency situation, as opposed to the markets physical capability. This means that the lower HRCs may underestimate the risk of shortage, but as the risk increases, i.e. when storage is at the 10% HRC, they provide a more accurate representation of the risk.

Thermal Fuels Validation Process

In order to validate the assumption that thermal generation will always run in an emergency situation, we check that there are sufficient thermal fuels available to support this assumption. Since December 2018 when preparing the HRCs, we include an additional step to validate the thermal fuel consumption in the HRC modelling in light of known constraints to fuel supplies. This step was added to the process following consultation earlier in the year; please see here for more information on the consultation.

We first produce the HRCs without any thermal limitations to find the amount of thermal fuel required to support thermal generation in the model. We compare this to confidentially supplied information from relevant parties to see if current thermal fuel supplies are sufficient to support thermal fuel consumption in the near term HRCs (current month plus next month).

We only assess near term HRCs as any longer-term assessment requires a prediction of future market behaviour, including generation assumptions and fuel supply arrangements. We do not believe it possible to model this in an objective and robust way. Therefore, the assessment of thermal fuel consumption assumes that in the long-term (3-24 months) there will be no thermal fuel constraints.

Our process is to first determine available natural gas using historical production values and coal supply using information from Genesis. Following this we take out the amount of natural gas we do not believe to be substitutable during an emergency (i.e. gas that would not be made available even in an emergency situation, for example residential gas consumption). This residual value is then compared against thermal fuel required in the HRC model (accounting for the use of available coal supply). This is not based on existing contractual arrangements, but arrangements we believe would be put in place in an emergency situation.

Some of the detailed information that this verification step utilises is confidential due to its commercially sensitive nature, which means we cannot disclose the specific assumptions we have used. The HRC assumptions document is produced with each HRC update, and includes a table of assumed generation from coal and gas.

If after this validation step, we find that there is insufficient thermal fuel to support thermal generation required in the HRCs, we re-run the model with appropriate restrictions to thermal generation. This is typically included as either a de-rating or outage of a thermal generator.
Impact of Thermal Fuels on the HRCs

A de-rating of thermal generation was included in the published February 2019 HRC update - further outages at the Pohokura gas field during March and April meant that there would be insufficient gas to support thermal generation at 100% capacity. This lack of supply was included into the HRC model as an outage of one CCGT on dates that aligned, to the best of our knowledge, with these production outages. The impact of this thermal fuel restriction can be seen below in Figure 1. This figure shows this thermal fuel constraint increases the HRCs slightly during the months of the outages.

![NZ HRCs Comparison Between February 2019 HRC Update, Including and Excluding Thermal De-Rating](image)

Figure 1: Comparison between standard and thermal de-rated February 2019 HRCs

The circumstances of Spring 2018 were a valuable reminder of the significant impact that thermal fuel restrictions can have on security of supply. Mindful of this, we have recently been carrying out scenario analysis to investigate the impact of major thermal fuel constraints on security of supply, to demonstrate the potential impact on the HRCs. To date we have published two scenarios - a gas supply shortage scenario and a gas pipeline disruption scenario. In each of these scenarios, the HRCs are increased, as seen in the figures on the next page. We are continuing to undertake further scenario analysis to help further inform participants about the security of supply risk, beyond the information provided in our Code-mandated risk reporting metrics.
Including an indefinite 50% de-rating to one CCGT leads to an increase of up to 600GWh in the HRCs.

Including an outage of gas generation in the North Island for 3 months over winter leads to an increase of approximately 1000GWh in the HRCs.

The next edition in this series will cover the how contingent storage is currently considered in the HRCs.