**Generation Assumptions in the Hydro Risk Curves**

What are the supply assumptions we use for generation?

As we discussed in our HRC 101 on Thermal Fuel Assumptions, the behaviour of thermal generators modelled in the HRCs is defined by the SOSFIP clause 6.1(b) “[The hydro risk curves must] assume market behaviour that seeks to minimise the use of hydro storage”. This clause is incorporated into the model as an assumption that generation from thermal resources will always be prioritised over hydro generation. While this assumption does not reflect normal market operation, it reflects the capability of the generation fleet to reduce controlled hydro generation and thus avoid a hydro shortage situation, which is the core purpose of the HRCs.

Generation behaviour for sources such as geothermal, wind and hydro must also be modelled to account for their generation capability throughout the year. These behaviours are included in the HRC model as generation profiles, either “profiled output” or “based on historical inflow sequences”, which are shown in Table 4 in the Hydro Risk Curve Assumptions Document. This table also includes additional information on future plant that will be commissioned in the next 2-3 years, and any de-ratings of plants due to notified restrictions in their generation capacity.

**Profiled output**

Generators that are identified as using a “profiled output” are modelled using predefined generation patterns based on historic output. The profiles change over the year due to historic patterns in operation, for example some geothermal generators have months where they typically generate more or less, and therefore their generation profiles vary from month to month. These profiles are comprised of 4 values: week-day; week-night; weekend-day; weekend-night. Historic output is typically averaged over the last 5 years, but we apply discretion in our modelling in some cases to account for irregularities such as major outages. Typically, geothermal and some run-of-river hydro generators are profiled as they follow predictable patterns in their annual generation. In the case of some hydro generators, we have insufficient plant and inflow information to model based on historical inflow sequences. For wind generation, we currently use a flat annual profile, but we are investigating ways of improving this.

**Based on historical inflow sequences**

Unlike the somewhat predictable generators (for example Geothermal generation), the generation patterns for hydro generators can vary each year depending on their levels of storage and inflow patterns. Larger hydro generators that have sufficiently reliable historical inflow datasets are modelled “based on historical inflow sequences” using historical inflows sequences as a basis for generation output. Weekly inflow datasets are created for Clutha, Manapouri, Waitaki, Tekapo and Waikato, Cobb, Coleridge and Waikaremoana, based on 87 inflow sequences since 1931. Generally, each of the modelled generators supply energy based on these historical inflow datasets, in addition to the amount of storage (if they have controlled storage) they have available. This is a complex calculation as generators store or use water to ensure a balance between avoiding spill and avoiding shortage. The generation quantities are determined using proprietary software provided by Energy Link. The average monthly generation profiles that were calculated using this method for the March 2019 HRC update are shown below:
The next edition in this series will cover the outages included in the HRCs.