Electricity Risk Curves

Changes to Reporting

The Security of Supply Forecasting and Information Policy (SoSFIP) sets out the System Operator functions for the provision of information and short to medium term forecasting. This policy was revised on 1 August 2019, and includes the following changes to our reporting:

- The Hydro Risk Curves (HRCs) will be renamed as the Electricity Risk Curves (ERCs).
- We will present four separate charts in our publication of Electricity Risk Information. The details of these charts are described further in this SOS101.
  - The Electricity Risk Status Curves
  - The Electricity Risk Curves – Percentage Risk
  - The Contingent Storage Release Boundaries
  - The Official Conservation Campaign Triggers
- Contingent storage will be included in the derivation of all of these new charts.
- The Energy Risk Meter will be renamed as the Electricity Risk Meter
- Watch and Alert Status on the Electricity Risk Meter and the Risk Status chart will be defined by a “time to Official Conservation Campaign (OCC)” approach, which is outlined later in this document.

Buffer and Floors

The new SoSFIP introduced buffers and floors. The buffer acts as a lower limit on the curves, allowing for pragmatic emergency management in low risk, low inflow situations. This buffer forces the curves to equal the buffer when they are calculated to be lower than the buffer. Currently we are using 50GWh as the buffer.

We are also introducing floors which represent the lower limit of available storage when contingent storage has not been released. These floors are equal to contingent storage that is made available at or after this point, but does not include contingent storage previously made available. The floors are only observed on the Contingent Storage Release Boundary chart but would be apparent on the Official Conservation Campaign Triggers chart and Electricity Risk Status Curves if some contingent storage was made available upon initiation of an OCC (which currently is not the case).
1. Electricity Risk Status Curves

The Risk Status chart includes Watch, Alert and Emergency status curves. The Emergency status is equal to that shown in the OCC Triggers chart, and the Watch and Alert curves are derived based on this Emergency curve using a “time to OCC” approach. This approach will estimate a future rate of decline in storage for a scenario where inflows are poor, and from this determine an estimated time until an OCC may be triggered. Watch Status will be triggered when we estimate we are within 8 weeks from triggering an OCC, and Alert Status will be triggered when we estimate we are within 3 weeks from triggering an OCC. Note, this will not impact access to contingent storage in any way, which is now determined and shown in the Contingent Storage Release Boundary chart. For reference, the Watch and Alert curves have been plotted against the historic 1% HRC and 4% HRC, which were the previous triggers for Watch and Alert status.

**NZ Electricity Risk Status Curves - Watch, Alert and Emergency Status**

Updated: 1 August 2019

(Lakes Taupo, Tekapo, Pukaki, Hawea, Te Anau & Manapouri)

Time to OCC Approach

The changes to Watch and Alert status mean that they are now calculated with a Time to OCC approach. This uses historical inflow sequences to calculate a rate of storage decline. Using these rates of decline and the Emergency curve, we can find the storage levels where an OCC would be triggered within 8 and 3 weeks.

The Time to OCC approach uses 87 historical inflow sequences to predict future storage sequences over the next 8 weeks for each month. An average decline of the worst 5% of sequences for each month are used to find the rates of decline for Watch (within 8 weeks) and Alert (within 3 weeks) for that month. This calculation is done for each month over the next 1-2 years, which means a different rate of decline is calculated for each month. This is appropriate seeing as inflows and
market behaviour change throughout the year, and thus storage will not decline at the same rate year round. Unlike the Electricity Risk Curves – Percentage Risk charts that act to conserve hydro storage by always dispatching thermal generation before hydro generation, the storage sequences are modelled including market behaviour similar to that used in the Simulated Storage Trajectories (SST) modelling. The 1% ERC is used as the start storage for each monthly sequence set in order to capture market behaviour at low lake levels.

We average these rates of decline over the worst 5% of sequences to determine a practical scenario that is reflective of very poor inflows. As a result, the Watch and Alert curves broadly represent a 5% chance of an OCC occurring within 8 and 3 weeks respectively – however due to a correlation between future inflows and inflows in recent weeks this number should be used with caution as it may be higher. Also as we are using the worst 5% of inflows rather than the worst sequence, it is entirely possible an OCC may occur earlier than 8 or 3 weeks. However, we estimate this to be accurate to within 2 weeks for Watch status – that is if the worst sequence were to occur, we would still have approximately 6 weeks to prepare for an OCC.

2. Electricity Risk Curves – Percentage Risk

As mentioned earlier, the Hydro Risk Curves will be renamed the Electricity Risk Curves to acknowlege the role that fuels other than hydro storage have in the management of New Zealand’s medium-term security of supply. To differentiate these curves from the Electricity Risk Status Curves, these curves are titled Electricity Risk Curves – Percentage Risk. These Percentage Risk ERCs will continue to be published for historical continuity with the HRCs, but will not be responsible for any risk status changes or any trigger events for OCCs. As well as being given a new name, the Percentage Risk ERCs will also include contingent storage in reported available storage.
For more information on how these Percentage Risk ERCs are modelled, see our previous versions of SoS101s, found at the bottom of this page.

3. Official Conservation Campaign Triggers Chart

The OCC Triggers chart will show the Emergency zone and the 8% risk curve, which are the triggers for starting and stopping an OCC. This chart will be used by the System Operator for calling the beginning and end of an OCC. The Emergency zone is derived from the 10% ERC, and the OCC Stop curve from the 8% ERC, which are compared against reported available storage that includes contingent storage. Both of these curves include the 50GWh buffer, but do not include a floor as no contingent storage is made available at the 8% or 10% ERC.

4. Contingent Storage Release Boundaries Chart

The Contingent Storage Release Boundaries chart will show any active release boundaries for currently available contingent storage. At the moment, only the contingent storage that becomes available at the Alert status is deemed accessible, so only the Alert Release Boundary is shown. This release boundary is based off the 4% ERC, rather than the Alert Status curve (see the next section of this document) – this is so that there is consistency with the historical method for determining if contingent storage is triggered or not. Some resource consents are phrased in such a way that they are linked directly to Alert status, but due to the significant changes to Alert status calculation (discussed in section 1. Electricity Risk Status
Curves), we have created the Alert Release Boundary to keep consistency with historical methods of determining access to contingent storage. The Alert Release Boundary includes a 50GWh buffer and floors which equal the contingent storage which is available at that level.

Currently 245GWh of contingent storage is available year round (from Lakes Pukaki and Hawea), and 220GWh from Lake Tekapo is available as contingent storage from 1 October to 31 March (seen as the step up on 1 October in the below chart).

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**NZ Contingent Storage Release Boundary**

![NZ Contingent Storage Release Boundary Chart](chart.png)

- **Nominal NZ Full**
- **NZ Alert Release Boundary**
- **NZ Available Storage**

△ refers to an update to the ERCs: see ERC Assumptions Document for more information

Updated: 1 August 2019

(Lakes Taupo, Tekapo, Pukaki, Hawea, Te Anau & Manapouri)