IMPORTANT

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1 THERMAL WHAT-IF SCENARIOS

We have carried out our quarterly analysis of thermal fuel scenarios to provide insights into what impact fuel availability could have on security of supply over the next year. This month we have updated the two standard scenarios:

- the impact of a gas supply limitation or generation plant failure,
- a gas pipeline disruption, like that experienced in 2011 when the Maui pipeline was out of service while repairs were made.

1.1 BASE CASE

The most recent ERCs and Simulated Storage Trajectories (SSTs) were published on 31 March 2020. These charts have been included below as a base-case for comparison. In this chart Security of Supply status is shown by the Watch, Alert and Emergency curves. The SSTs are the cluster of 87 sequences that start from 20 March 2020. In this month’s ERC and SST update, no sequences crossed any of the status curves, indicating there is currently no foreseeable risk of an emergency situation occurring.

A set of ERCs and SSTs have been produced for each of the thermal constraint scenarios and are specifically for the purpose of analysing potential future scenarios. It is important to note the SSTs are a complex model that includes a mix of objective and subjective inputs and assumptions, including market behaviour. Certain assumptions around generator behaviours can have major impacts on the results in the SSTs, and therefore while the charts included here may represent one possible outcome of constraints in the gas market, there are many different possible outcomes depending on these assumed behaviours and specific situations modelled.

The South Island ERCs and SSTs for the base-case, as well as the two thermal scenarios, can be seen in the Appendix.

1.2 GAS SUPPLY SHORTAGE SCENARIO

In this scenario, one CCGT is indefinitely de-rated to 50% capacity from 1 May 2020 to represent a decrease in available gas supply for electricity generation or reduction in plant availability. This scenario
could arise from a range of situations including upstream gas supply outages and limitations, or unplanned plant outages.

In the chart above, no sequences crosses the Watch status curve. This gas constraint effects both the ERCs and the SSTs. Restricted generation means the Emergency Status Curve increases by up to 300GWh. The chart below shows the change to the Emergency curve when the thermal constraints have been modelled.

The gas constraint also impacts the SSTs in that the sequences fall to lower storage levels more rapidly as more water is used to meet demand due to reduced thermal generation.

1.3 Gas Pipeline Disruption Scenario

This scenario reflects a major infrastructure failure – the complete loss of gas transmission to major North Island electricity generators for an extended period (from 1 May 2020 to 31 July 2020). This scenario is reflected in the model by reducing Huntly gas-fired generation to zero for 3 months. This is an extreme, but plausible, scenario (in 2011 an unplanned outage on the Maui pipeline lasted five days) and is designed to test the edge of the envelope in terms of plausible futures.
In the chart above, no sequences touch the Watch status curve. Similar to the gas constraint scenario, both the ERCs and SSTs are impacted by the loss of gas transmission in the North Island. In this scenario, the Emergency Status Curve rises by up to 650 GWh. The chart below shows the change to the Emergency curve when the additional thermal constraints have been modelled.

The increase to the ERCs is more pronounced in this scenario due to the scale of lost generation caused by the disrupted fuel supply. The SSTs also fall at a faster rate, again due to increased hydro generation to cover the loss of thermal generation.

1.4 WHAT DOES THIS ALL MEAN?

These scenarios show how a failure of a significant component of the New Zealand energy system can have a major impact on security of supply. Small changes to the electricity system that occur over a long period of time, such as gradually increasing demand, allow for a market response to keep supply and demand in balance, for example, by building new generation. But in sudden events such as the failure of major equipment, there is little time for the market to respond. Additionally, security of supply is a balance between avoiding emergency situations without over investing in costly generation. Similar to the thermal scenarios published in September 2019, no sequences cross the Emergency status curve in either thermal fuel scenario. This is largely due to the currently high level of hydro storage in the South Island hydro catchments.
2 APPENDIX: SOUTH ISLAND CHARTS

2.1 MOST RECENTLY PUBLISHED SOUTH ISLAND ERCs AND SSTs

SI Available Storage and Status Curves

Updated: 31 March 2020

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

Actual storage courtesy of NZX Hydro

Nominal SI Full

(Projected range of storage scenarios)

Available Storage

Nominal SI Full  Mean  90th Percentile  10th Percentile  Watch  Alert  Emergency

(South Island ERCs and SSTs)
2.2 South Island ERCs and SSTs for Gas Supply Shortage Scenario

SI Available Storage and Status Curves - Gas Shortage Scenario

Updated: 31 March 2020

Actual storage courtesy of NZX Hydro

For Illustrative Purposes Only

2.3 South Island ERCs and SSTs for Gas Pipeline Disruption Scenario

SI Available Storage and Status Curves - Gas Pipeline Scenario

Updated: 31 March 2020

Actual storage courtesy of NZX Hydro

For Illustrative Purposes Only