Generator Outage Survey Outcomes and Implementation in Reliability Assessment

AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

Content

1. Background
2. Generator survey outcomes
3. Do PLEXOS simulations model unit outages appropriately to capture the observed behaviour?

Background

- For AEMO to deliver meaningful forecasts, it is important to constantly re-visit the validity of inputs into models
- One of the inputs into our reliability modelling is the assumed availability of generators
- AEMO gathers both summer and winter capacity information as well as forced outage information from participants

Background

- With an ageing fleet of thermal generators in the NEM, it is important to capture a representation of the magnitude and frequency of failures

- As part of its data integrity check process, AEMO measures its modelling outcomes against historical outcomes to ensure that data provided by participants is representative and being used correctly by AEMO

Generator survey outcomes

Seasonal capacities and Forced Outages

Seasonal Capacities

- For Electricity Statement of Opportunities (ESOO), market participants are required to submit to AEMO both summer and winter capacities for each generator.
- Summer capacities are based on ambient weather at the time of 10% POE peak demands.
- In our ESOO modelling Summer capacities are used from November until end of March for mainland regions and December until the end of March for Tasmania.
- Seasonal capacities are also applied to intermittent renewable generators.

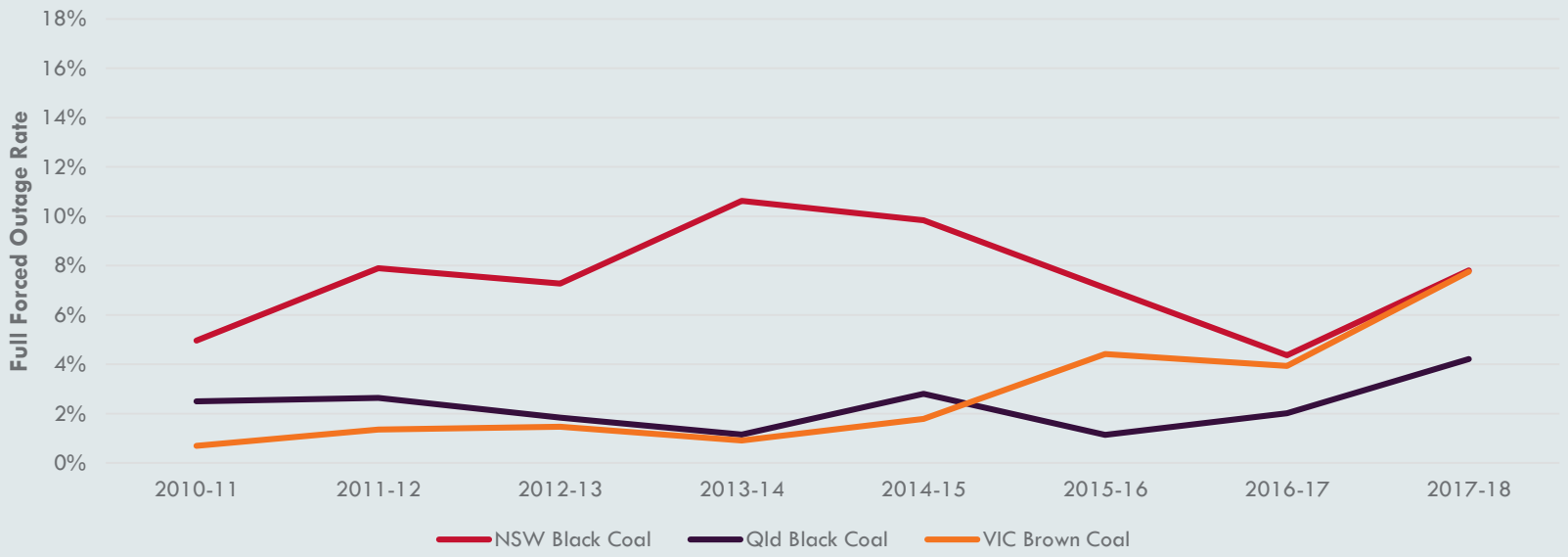
Forced Outage Rates

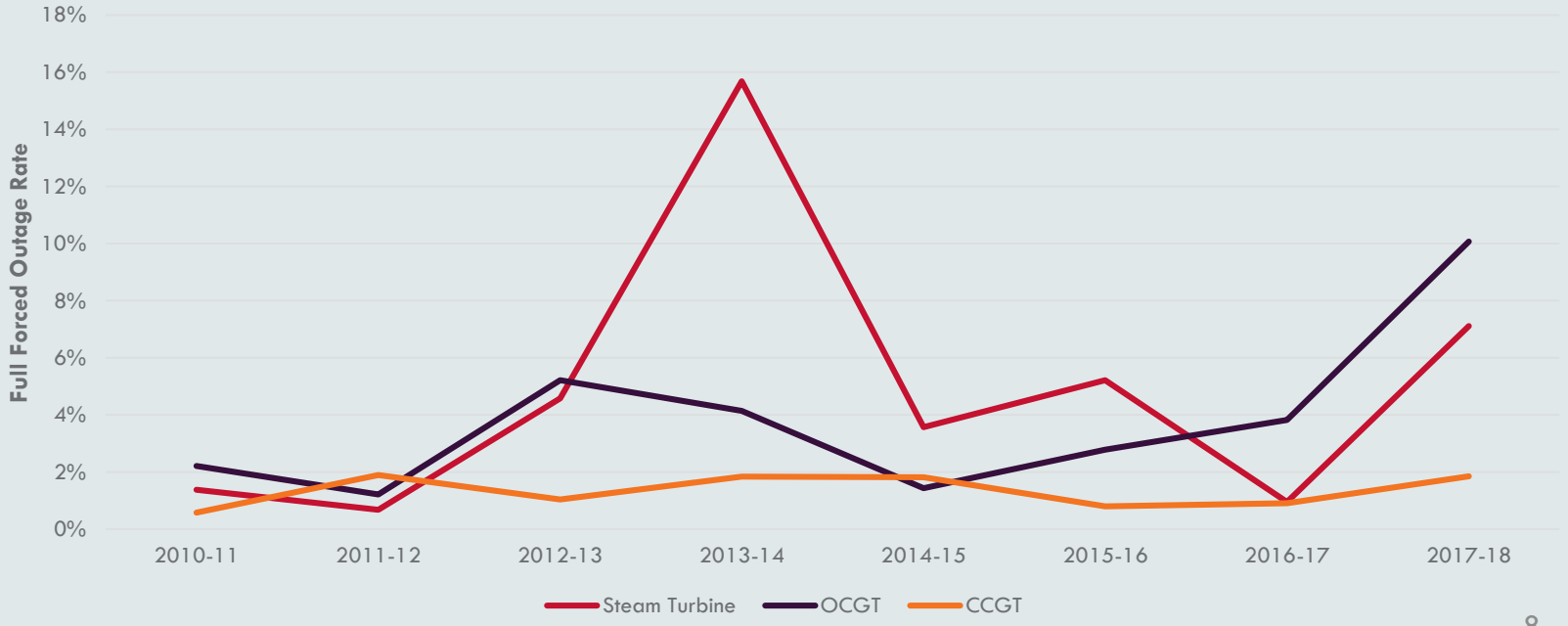
- Market participants are required to submit to AEMO 'Forced Outage' data every year for each generator unit.
- An outage (including full outage, partial outage or a failed start) is considered "forced" if the outage cannot reasonably be delayed beyond 48 hours.
- Existing methodology involves AEMO calculating the averages of these values, aggregated by fuel type, region and/or technology, from yearly data that has been reported by participants

- In our reliability modelling both full and partial outages are modelled using:
  - force outage rates (FOR)
  - partial outage rates (POR), and
  - mean times to repair

Aggregation

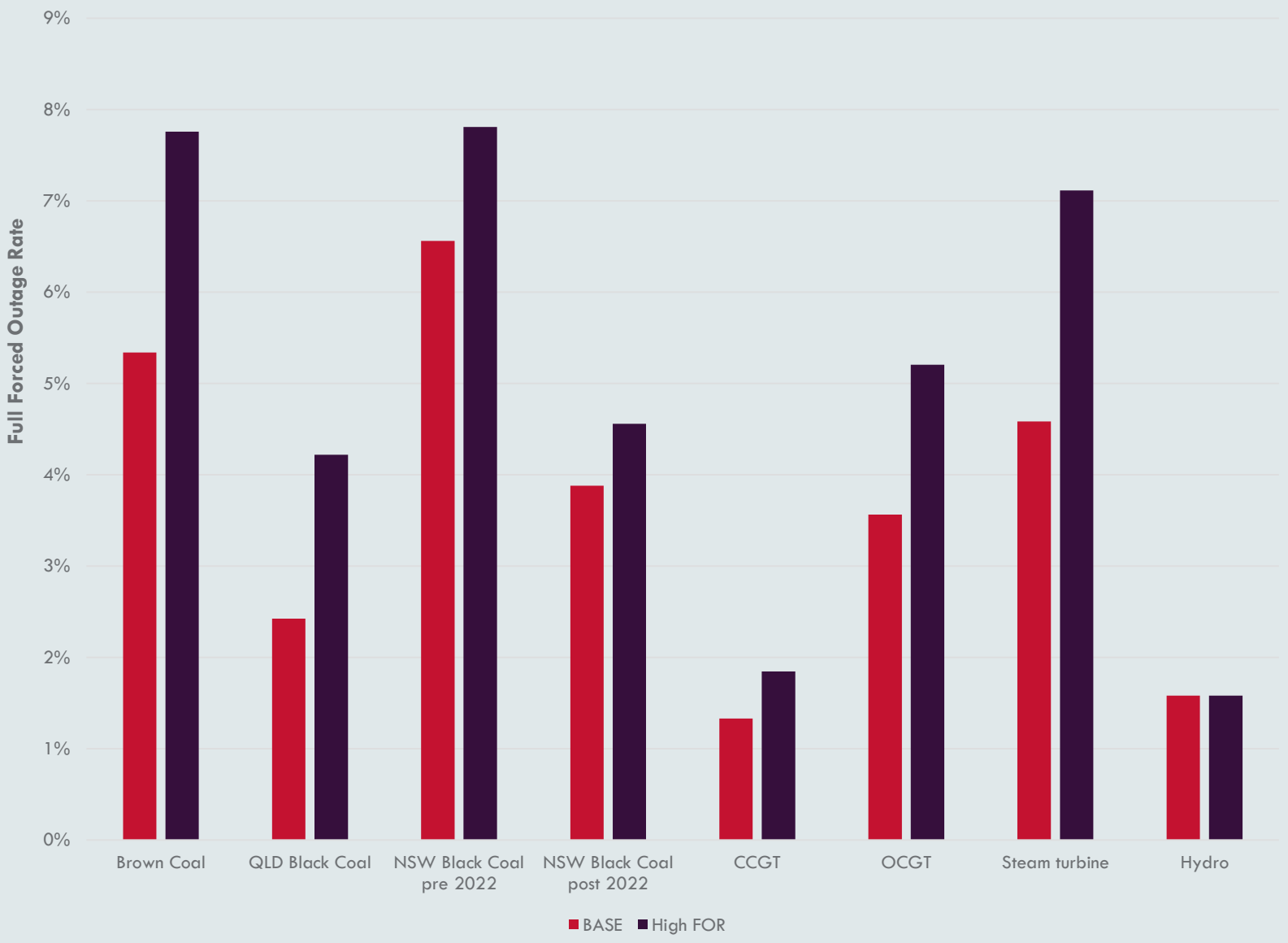
- Coal FOR data has been aggregated by region using data from the most recent 3 years
- Steam Turbine FOR has been aggregated using data from the most recent 3 years
- Open Cycle Gas Turbines (OCGT) and Combined Cycle Gas Turbines (CCGT) FOR has been aggregated using data from all years





High FOR Scenario

- Possible increase in future FOR as existing generators age
- Some years have higher historic levels of FOR which could also occur in the future
- The year with the highest FOR was chosen from the last 3 years for all aggregate groups except for OCGT and hydro.
- OCGT used 2nd highest year from all data due to very high 2017-18 data. Hydro FOR was kept the same.



Simulated outcomes

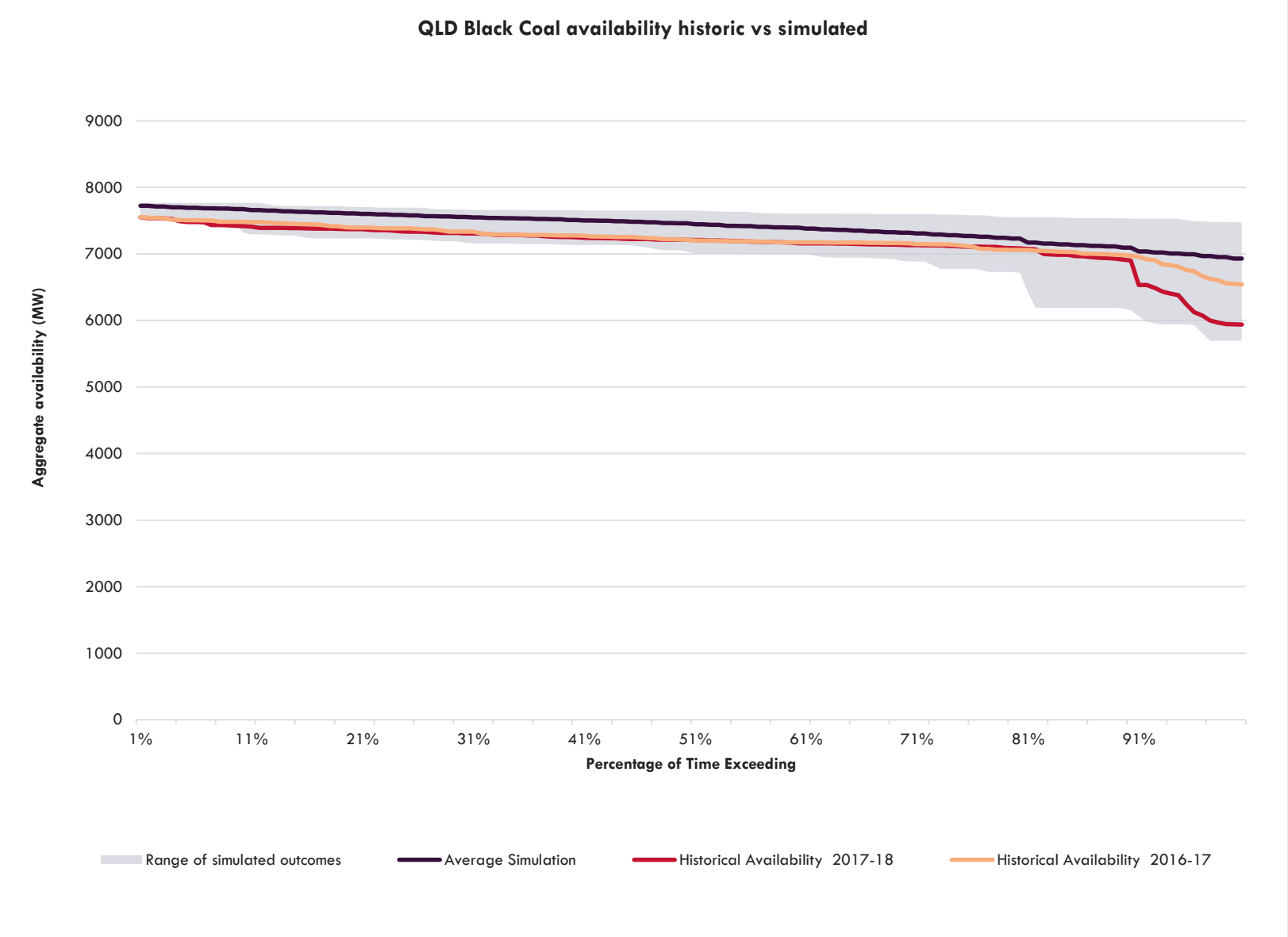
Do our simulations adequately reflect reality?

Simulation outcomes – performance monitoring

- Using the latest data collected in PLEXOS we can look at modelled outcomes compared to historic
- The simulation data shows availability for 50 iterations for 10 days in 2018-19 for hours between 14:00-20:00
- The historic data shows availability for the 10 highest demand days for periods between 14:00-20:00 for 2016-17 and 2017-18
- Availability is only shown for generators that are in both historical and simulated data

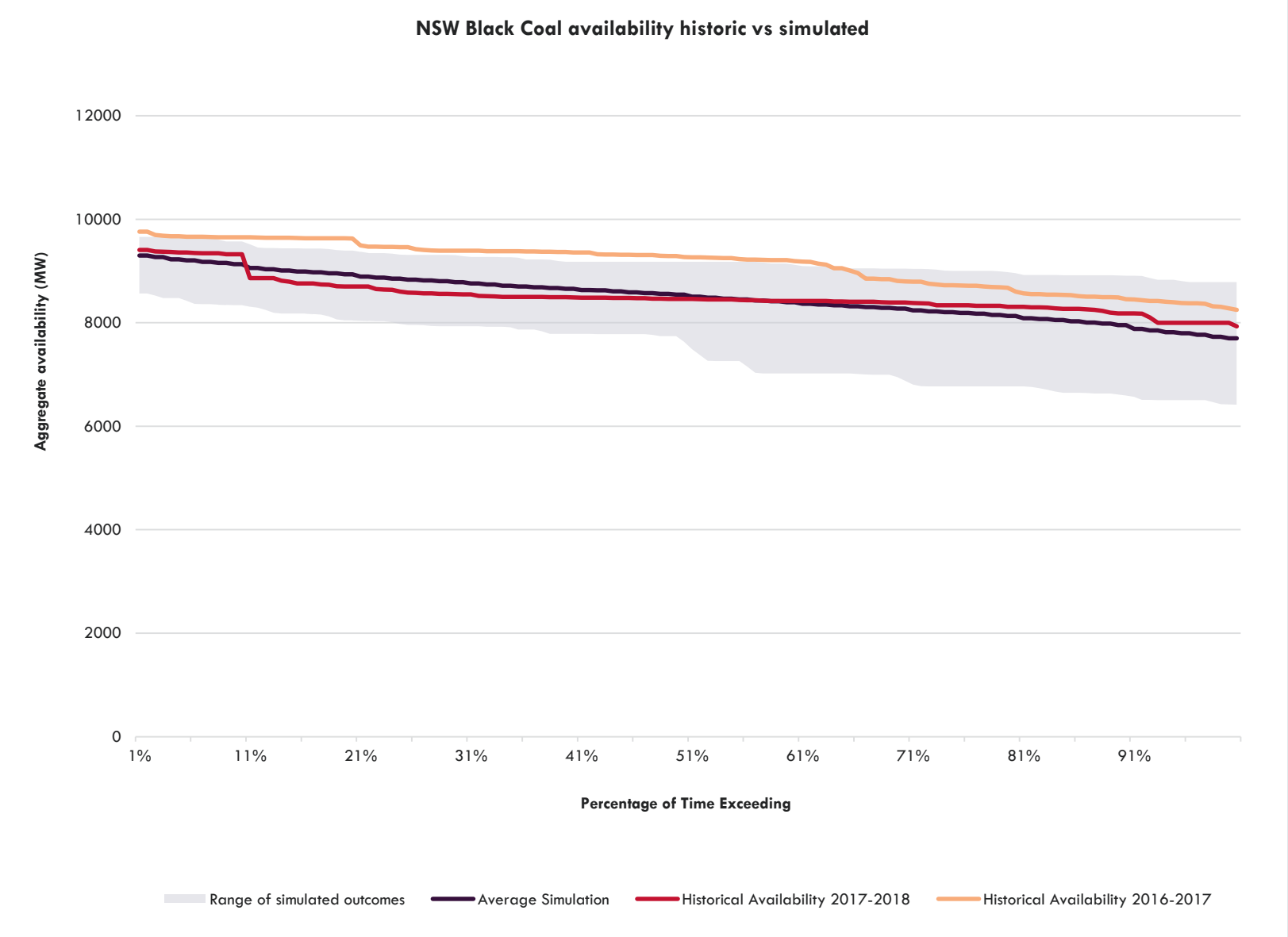
QLD black coal generator availability

- Average simulated data has a higher availability than historical
- Both historical years have very similar availability



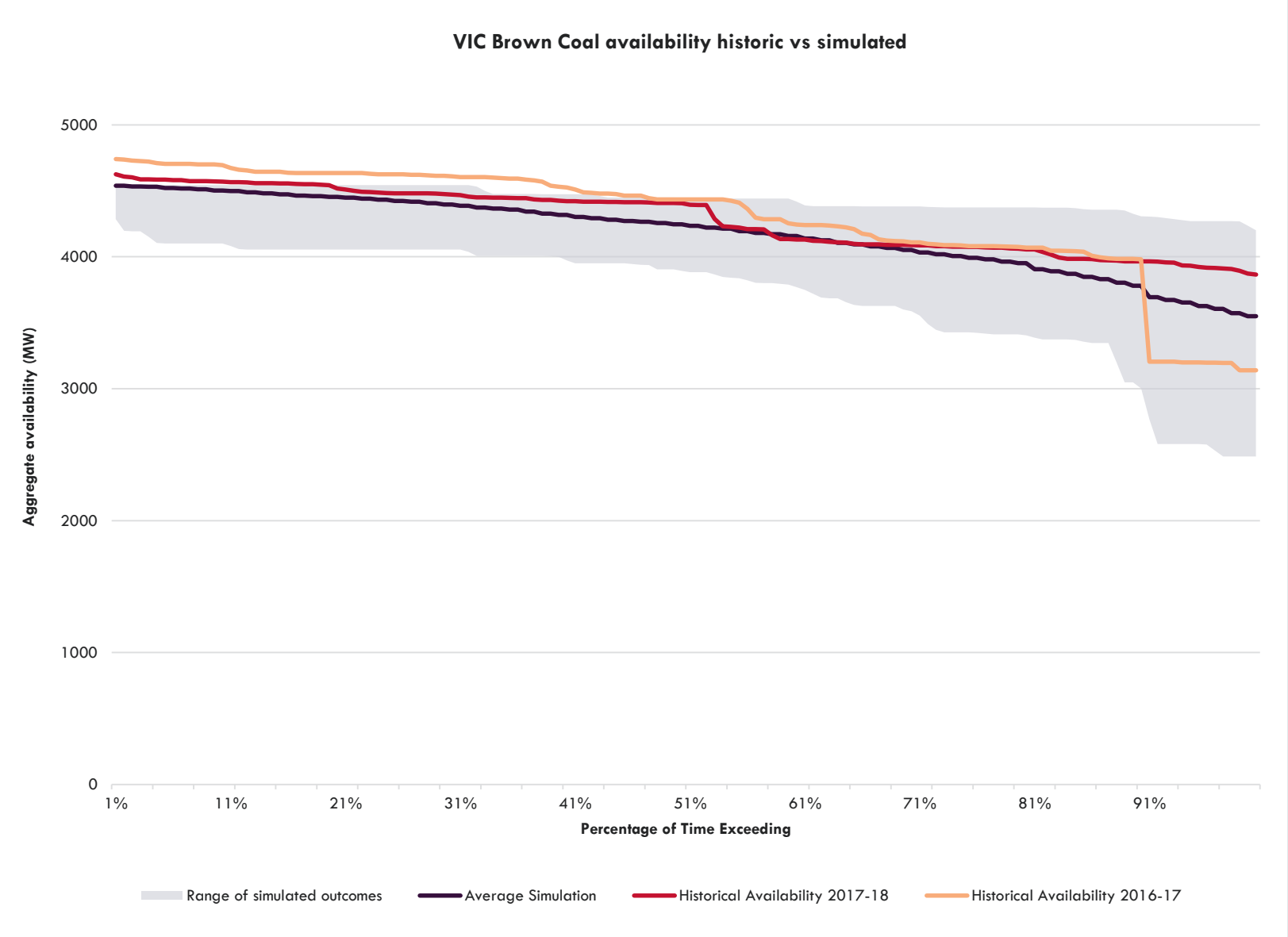
NSW black coal generator availability

- Average simulation data availability is close to 2017-18 historic data
- The 2017-18 historical availability is lower than the 2016-17 year
- This lower availability is due to higher forced outage rates occurring in this year



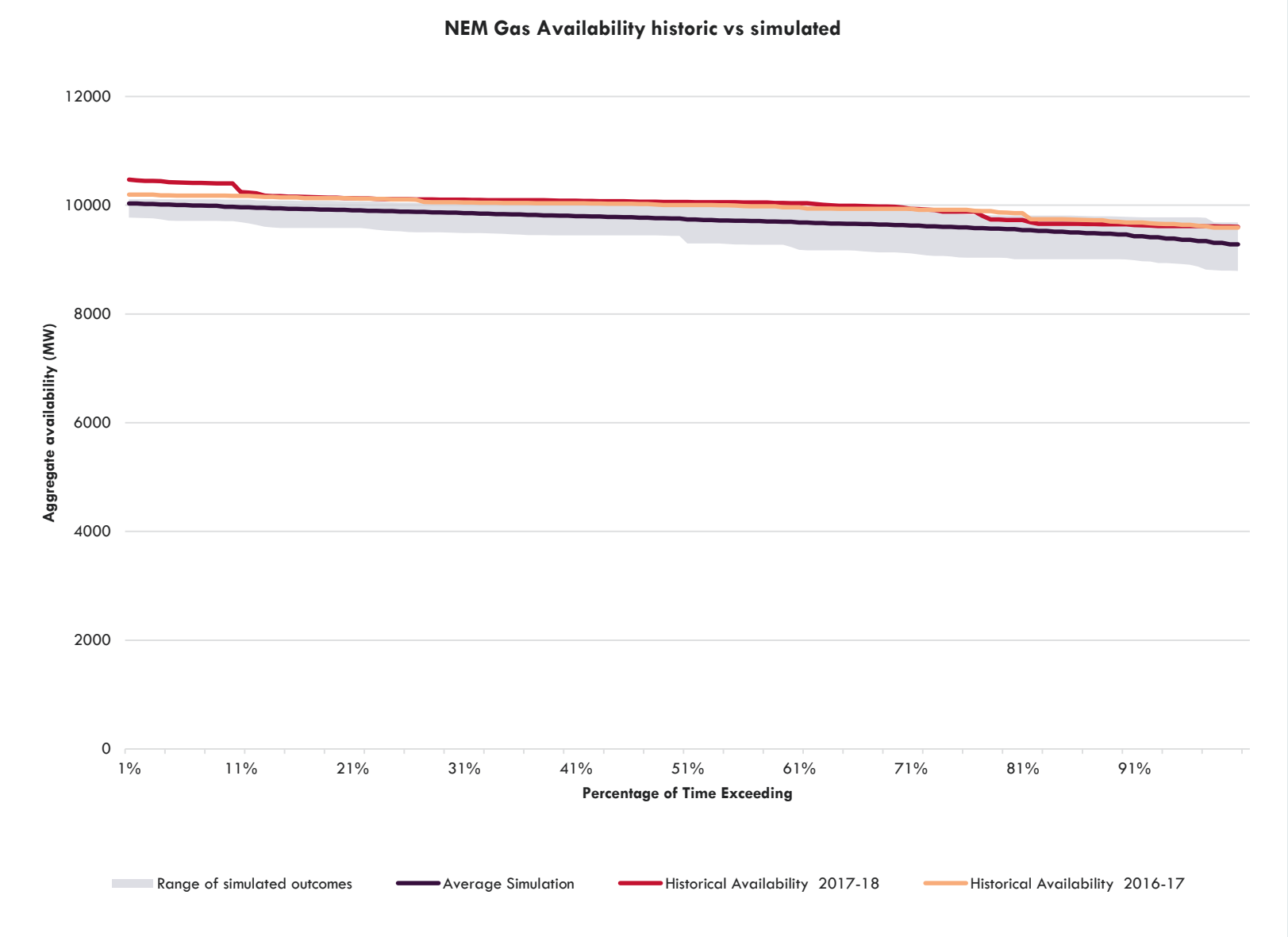
VIC brown coal generator availability

- Average simulation availability is generally slightly below historical availability
- 2016-17 samples had 1 day with multiple unplanned outage events
- Similar events were captured in our range of simulations



Gas-fired generator availability

- The reported data has much more of a similar shape to the simulated data – as expected
- The reported data is somewhat representative of the average observed from the simulations, noting that a small historical sample set is used



Simulated availability conclusion

- The simulated outcomes are close to the historic availability in the previous two financial years.
- AEMO's range of modelling outcomes has also captured most of the highest and the lowest observed availabilities within the range of simulated outcomes.
- AEMO is developing a range of forecast accuracy measurements and will continue to review and compare data both in aggregate and for individual units when it receives updates.
  - This includes comparing both outage rates and summer derated capacities for individual generators against actual observations at 10% POE reference temperatures

Questions?