Climate change factors

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Background and Purpose

Today's presentation includes:

- A brief overview of AEMO's approach for analysing the physical risks arising from climate change.
- An opportunity to review and discuss the proposed climate change adjustment factors for use in the ISP and reliability forecasts.

Timing	Topic	Responsible
July 2020	Preliminary discussion on climate change risk analysis strategy	AEMO
Today	Discussion on 2021 climate change adjustment factors	AEMO
July 2021	IASR published	AEMO
Aug 2021	2021 ESOO published	AEMO
Dec 2021	Draft ISP published	AEMO

Extreme Event Case Studies explore system planning implications, and differentiate between solutions

- The 2020 ESOO included a study on the potential impact of bushfires.

- The Electricity Sector Climate Information (ESCI) project will soon publish a case study exploring the impacts of a coincident heatwave and bushfire event on power system outcomes. The purpose of the case study is to demonstrate the use of climate data for extreme event risk management.

- The 2022 ISP may include numerous other case studies to explore the impacts of extreme weather and power system events. They are likely to include consideration for:
  - Cyclones and hailstorms
  - Extreme wind and water droughts
  - Extreme coincident heatwaves
  - Bushfires

Risk analysis incorporates quantified climate trends in modelling

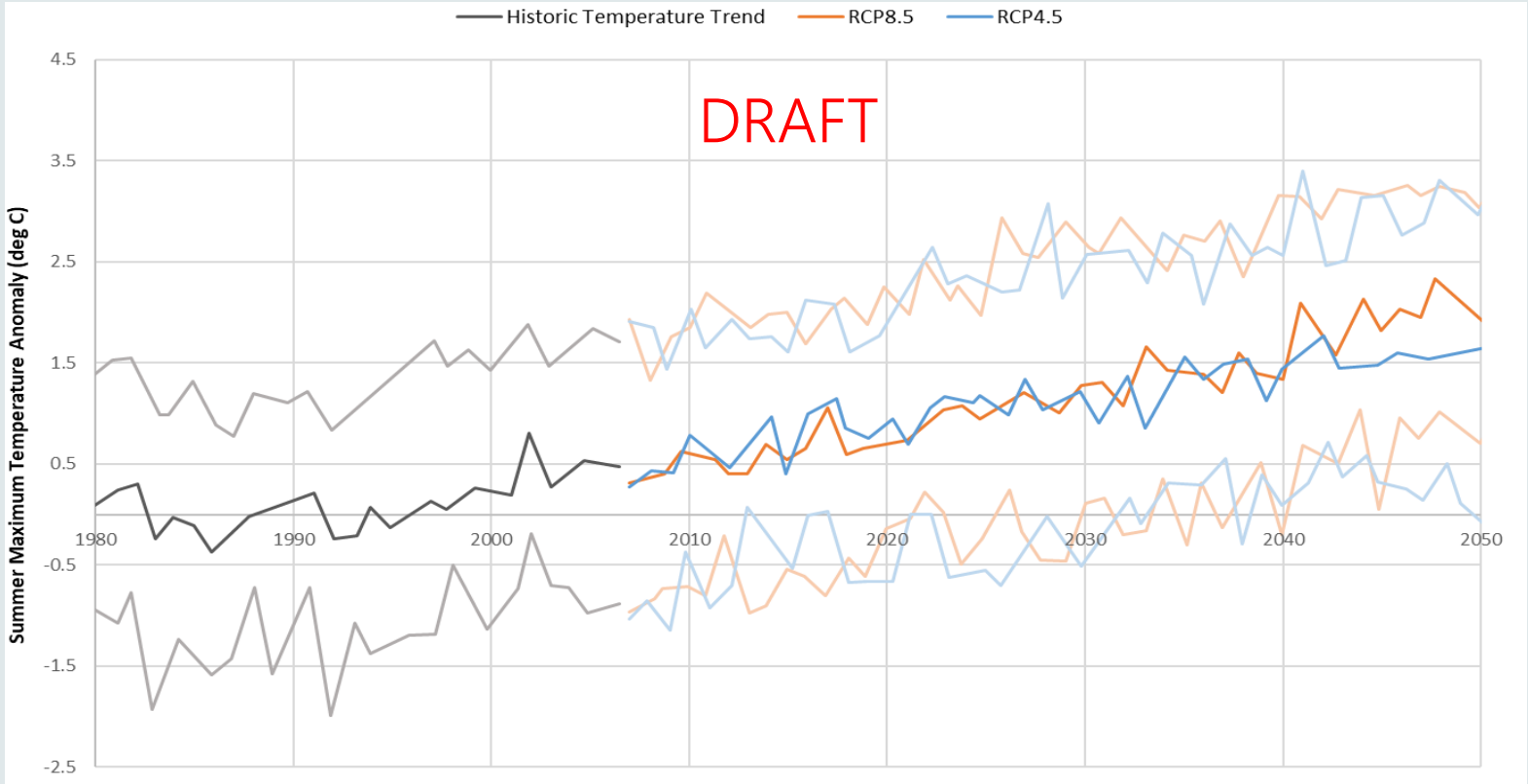
Climate trends, provided by climate scientists, are embedded in market modelling, where relevant and material.

The following adjustments are proposed:

- Temperature adjustments for consumer demand (ESOO & ISP)
- Temperature adjustments for transmission thermal ratings (ESOO & ISP)
- Bushfire risk adjustments for transmission unplanned outages (ESOO)
- Hydro dam inflow adjustments (ESOO & ISP)

Temperature adjustments are needed to accurately reflect future climate

Southern Australia summer maximum temperature anomaly



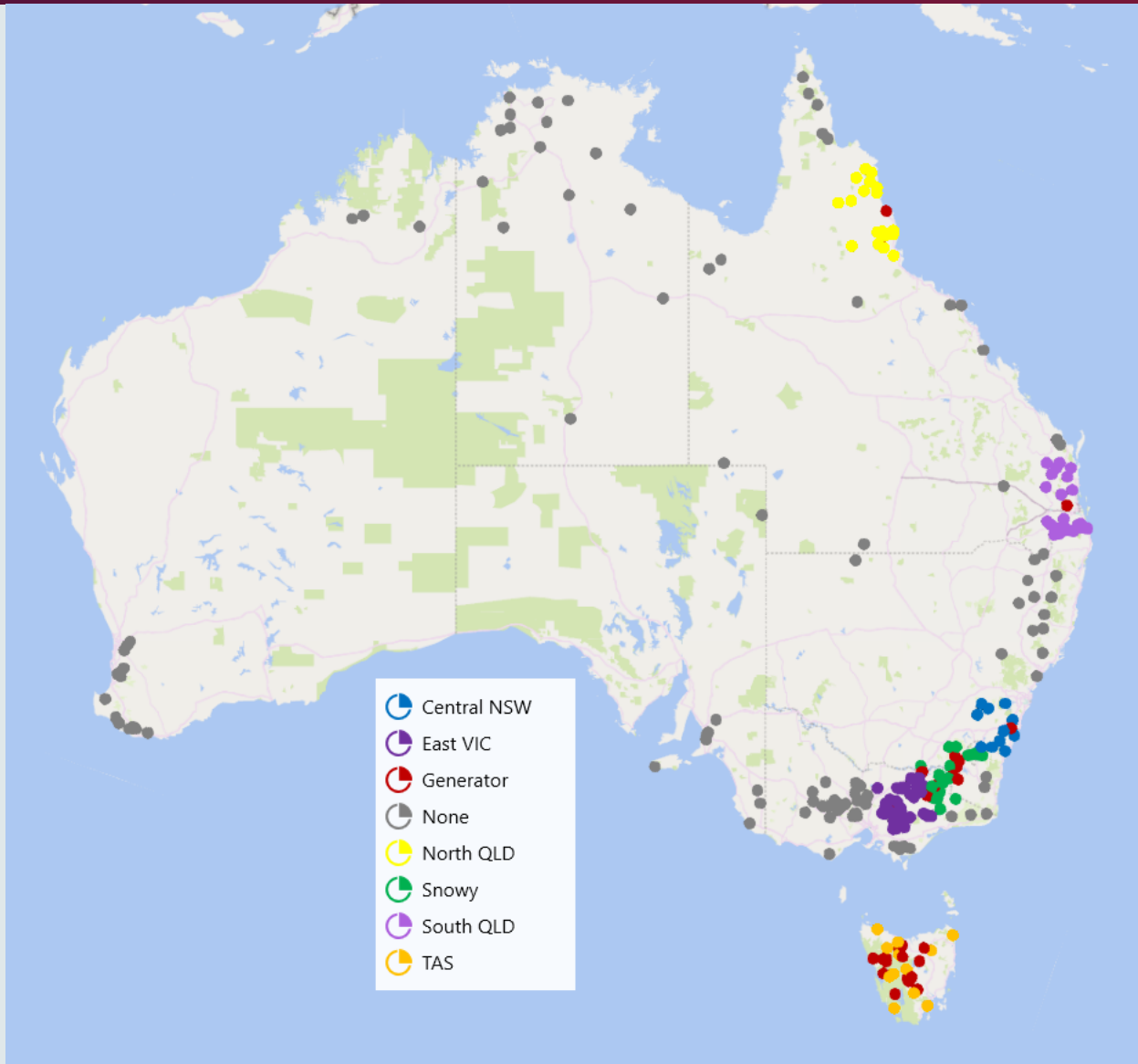
AEMO incorporates climate change in its demand forecasts, and adjusts historical weather outcomes to apply in future years based on the outcomes projected by forecast climate models. These factors are applied to transmission thermal ratings where relevant.

Climate data is collected from the CSIRO and BoM's website Climate Change in Australia. For more information on this, see Appendix A.2.3 of the Electricity Demand Forecasting Methodology Information Paper.

At https://www.climatechangeinaustralia.gov.au/en/climate-projections/explore-data/data-download/station-data-download/.

Hydro Change Factors – key locations

- BOM provided streamflow change factors forecast for 220 different locations in Australia as part of the ESCI project.
- These locations were grouped in six different areas, based on the proximity to existing hydro generators.
- No material variation was observed between Victorian, New South Wales, and southern Queensland trends, and are therefore aggregated as 'Southern Australia'.



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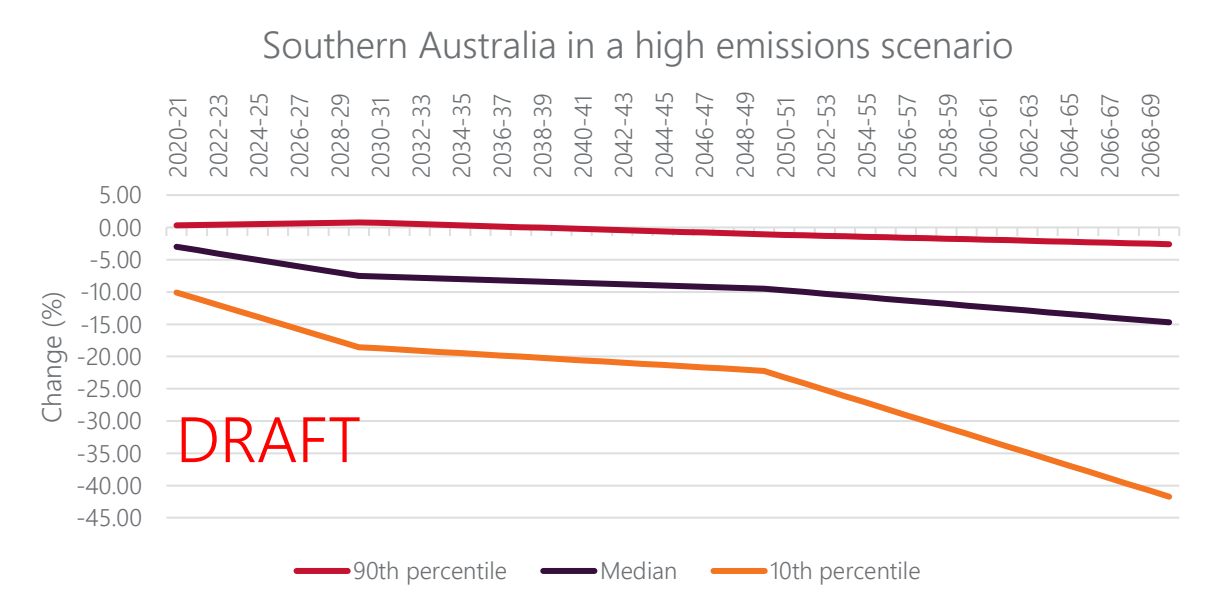
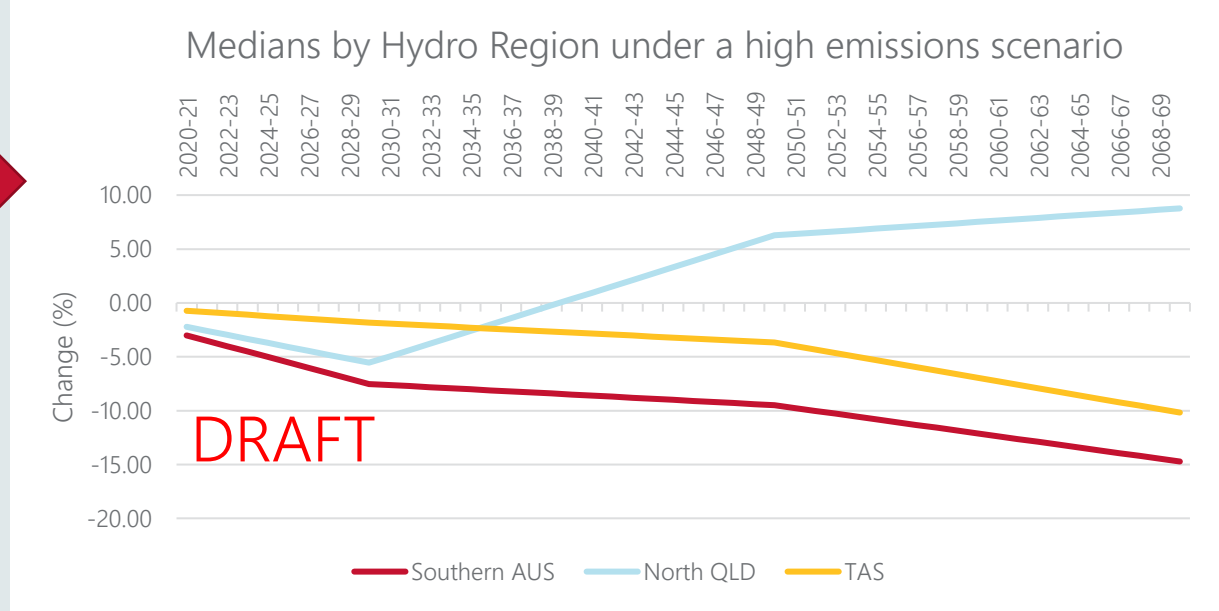
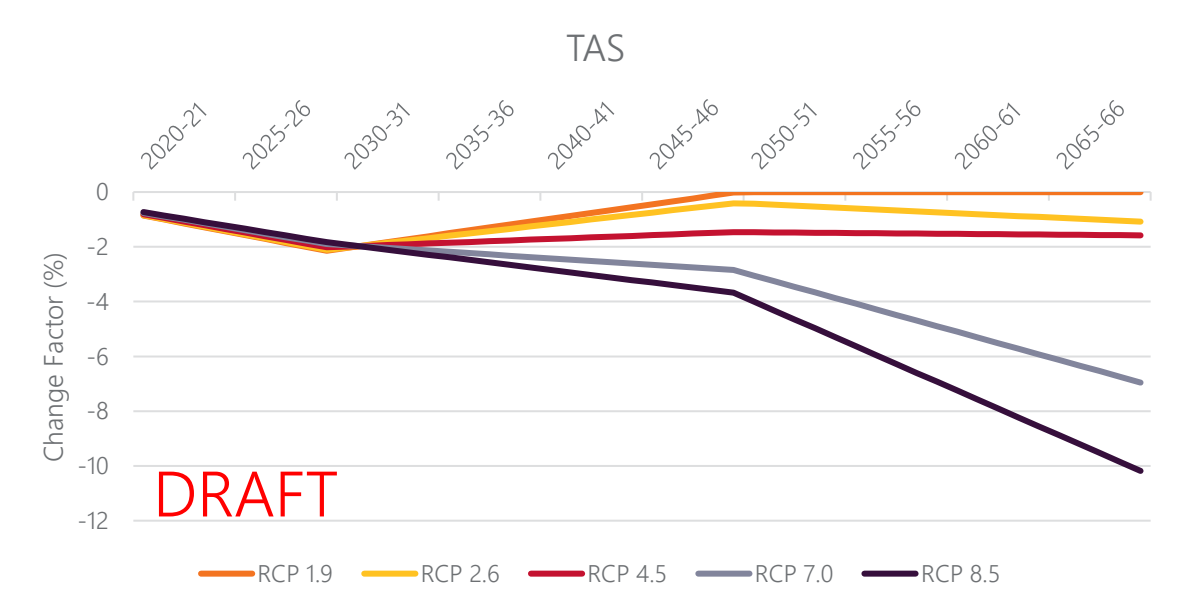
Hydro Change Factors – median selection

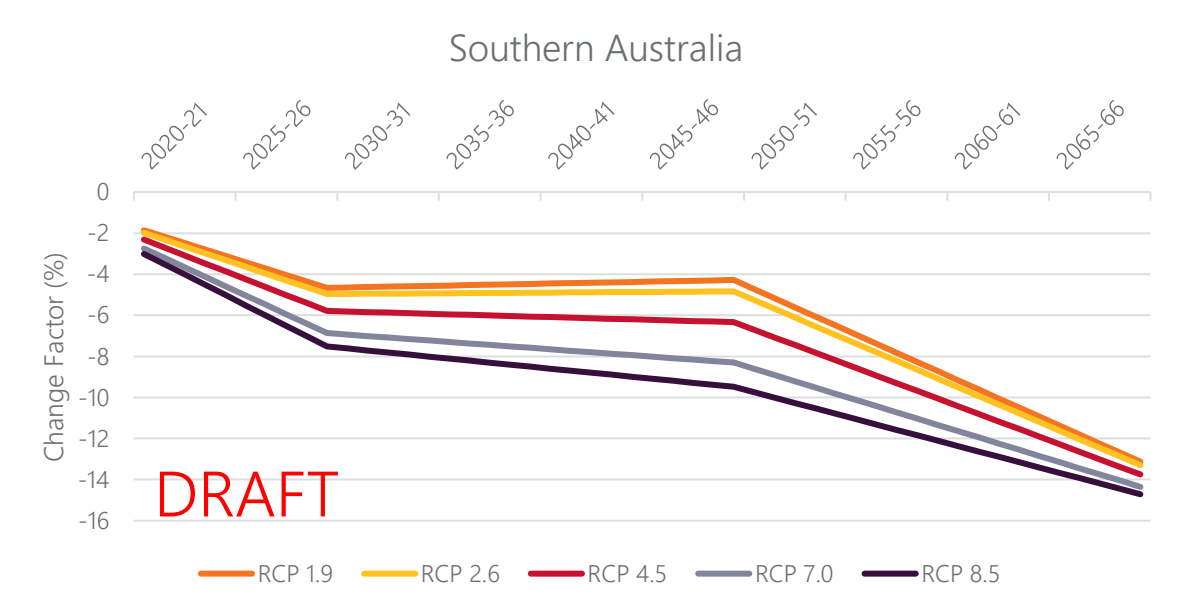
- 16 projections were provided by BOM (4 climate models x 4 correction/ downscaling methods)
- Percentiles were taken for each hydro region, which indicate the range of possible outcomes.
- AEMO implements the median projection, reflecting a further 15% reduction in Southern Australian dam inflows by 2070 (or 10% by 2050).





Representative Concentration Pathways (RCPs) drive median dam inflow trajectories





Scenario	Slow Change	Steady Progress	Net Zero 2050	Step Change	Hydrogen Superpower
Representative Concentration Pathway (avg temp. rise by 2100)	RCP 7.0 (4°C)	RCP 4.5 (2.6°C)	RCP 4.5 (2.6°C)	RCP 2.6 (less than 2.0°C)	RCP 1.9 (less than 1.5°C)

RCP 4.5 and RCP 8.5 results were adjusted proportionally to the RCP associated to each ISP Scenario

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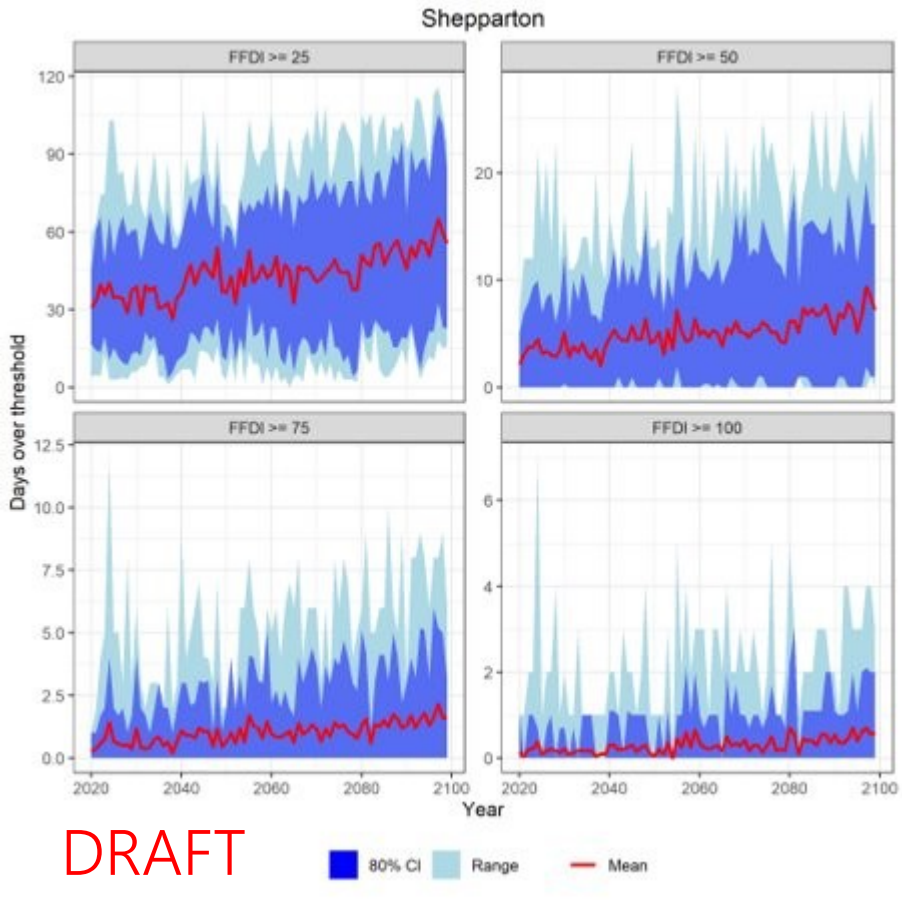
Bushfire weather adjustments are needed to accurately reflect future climate

- The Forest Fire Danger Index (FFDI) recognises the combination of rainfall, humidity, temperature and wind that correspond with fire risk, as used by fire agencies
- FFDI is projected to increase over the next few decades, regardless of emissions pathway.
- The following projections are provided by CSIRO and BoM and show an approximate 30% increase in hazard between 2020 and 2050.
- The adjustment factors will be applied to transmission outage rates that arise from bushfire interactions.

https://www.climatechangeinaustralia.gov.au/en/projects/esci/