2022 Forced Outage Rates

June 2022 FRG Meeting

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Background and Purpose

The purpose of today's presentation is to present and discuss the 2022 Forced Outage Rates (FOR) forecast, a key input to the 2022 Electricity Statement of Opportunities (ESOO).

Today's agenda includes:

- Purpose and method
- Generator forced outage rates
- Unplanned transmission outage rates
- Discussion

Timing	FOR projections	Responsible
Jan 2022	FRG Consultation on Unplanned transmission outage rates	AEMO & Stakeholders
Today	**Presentation of 2022 Unplanned transmission and generation Forced Outage Rate forecasts**	**AEMO**
13 Jul 22	Written FRG Consultation submissions due	Stakeholders
Aug 2022	ESOO published	AEMO

Purpose

- Generator forced outage rates, and transmission unplanned outage rates impact forecast reliability outcomes.
- The methodology for generator forced outage rate calculation was last consulted on in 2020 when AEMO first requested coal and large gas generator participants to provide projections. This methodology has been implemented unchanged in 2022.
- The methodology for transmission unplanned outage rate calculation was last consulted on in January 2022, which has been implemented by AEMO in 2022 as agreed.

Generator long duration generation outages are averaged over 12 years

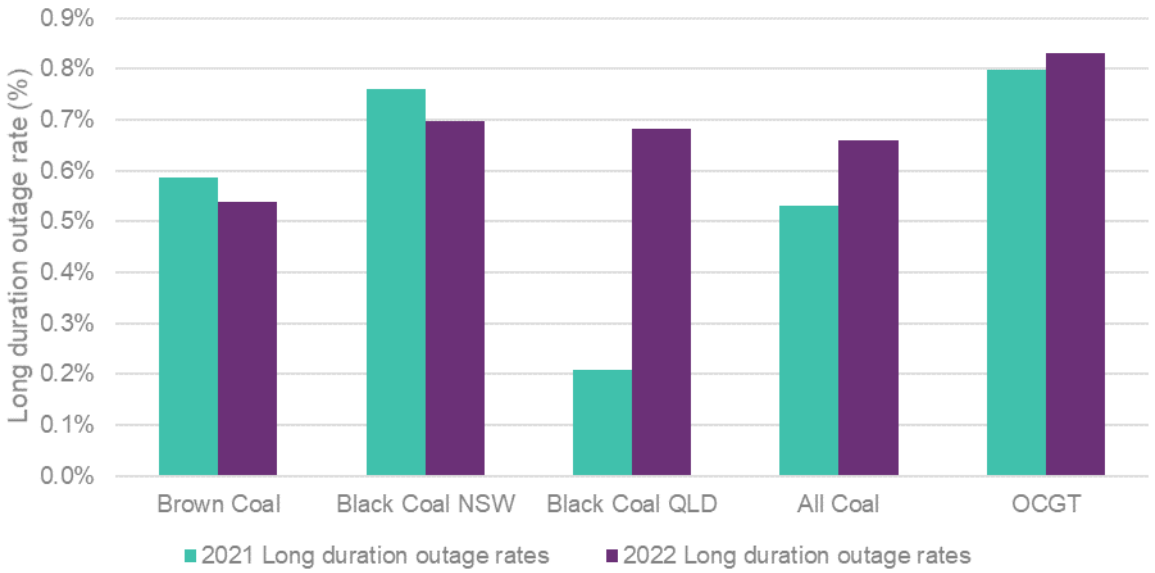
Long duration generator outages include all forced generator outages greater than 5 months.

Three long duration events were identified in 2021-22, all of which occurred in Queensland.

These outages are removed from the calculation of station specific outage rates and are instead applied to all stations within the technology category.

The rates implemented are calculated by obtaining a 12 year average rate.

Technology	Long Duration Outage Rates (12 year average)	Mean Time to Repair (hours)
Brown Coal	0.54%	5,290
Black Coal NSW	0.70%	5,568
Black Coal QLD	0.68%	5,423
All Coal	0.66%	5,466
OCGT	0.83%	6,411



Outage rate projections are provided by participants for coal and large gas fired generators

- Responses were received by all requested participants, including late submissions.
- In some cases, upon review AEMO requested revisions or further justification.
- In all cases, projections that have been implemented were provided by, or agreed in consultation with the station owner/operator.

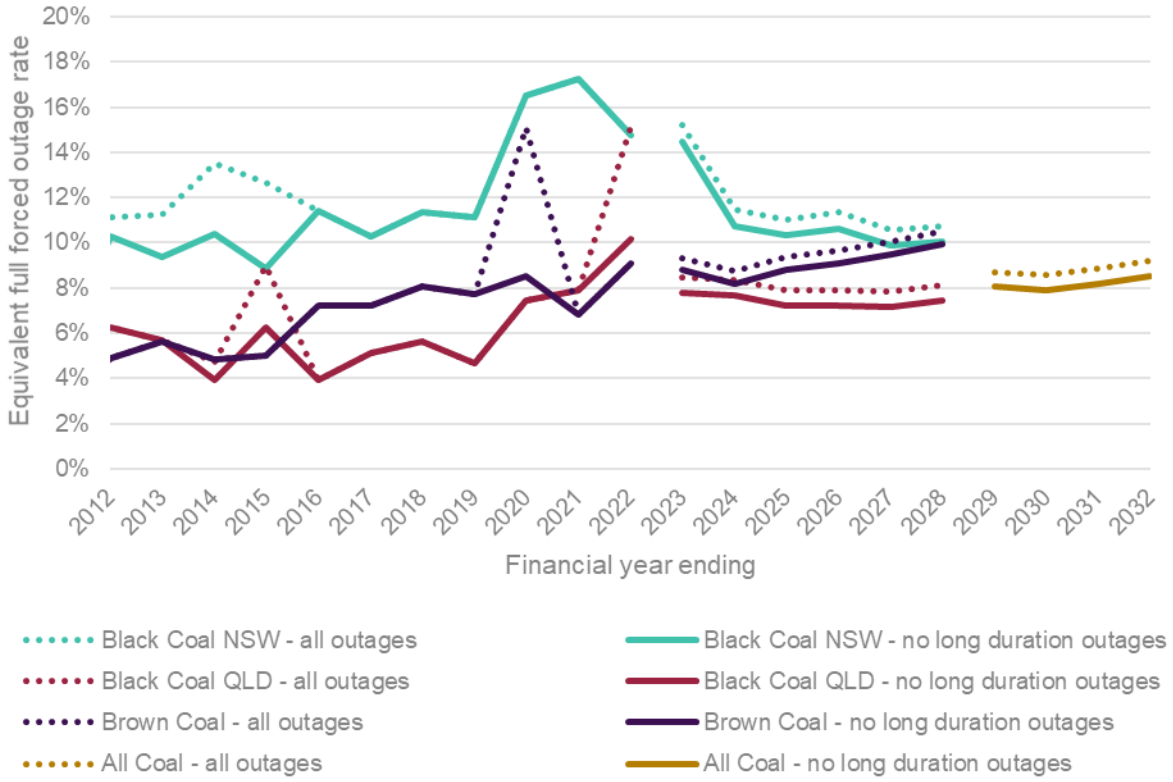
Coal fired generation equivalent full Forced Outage Rates are developed using participant provided projections

Station level full and partial forced outage rates are applied in the ESOO.

To protect confidentiality, only technology level aggregates are published, and used in published models like the ESOO published model, and ISP.

To protect confidentiality, all coal stations are shown as aggregated together in later years.

Participants' average equivalent full forced outage rate projections are steady around 8% to 10%



While NSW Black Coal projections show improvement, this is predominantly driven by station retirements, rather than projected unit reliability improvements.

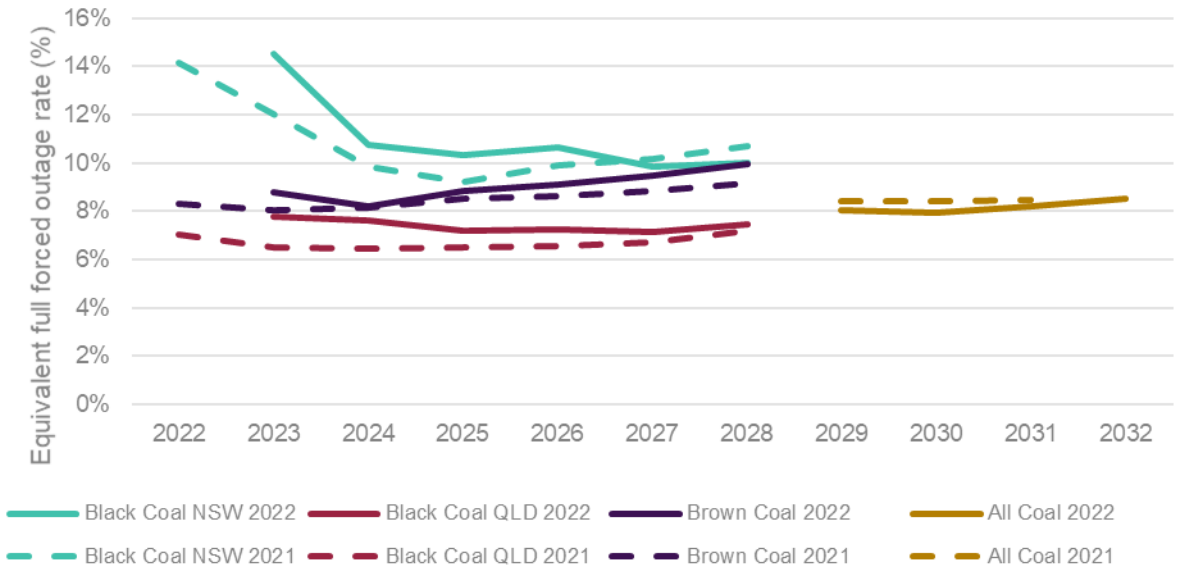
History comprises only stations currently in service

Participant driven forecasts reflect expectations of reduced NSW black coal Forced Outages Rates

Based on participant provided projections:

- Brown coal projections have increased over the projection horizon relative to 2021.
- QLD Black coal projections have increased over the projection horizon relative to 2021.
- NSW Black coal projections initially start above previous projections, but then show substantial medium term improvement, driven by station retirements, and participant expectations of remediations of issues affecting reliability.
- AEMO received justifications for this movement in FORs and will monitor actual FORs in the coming year against those forecast for 2023 ESOO purposes.

Comparison of 2021 and 2022 EFOR forecasts (excludes long duration outages)



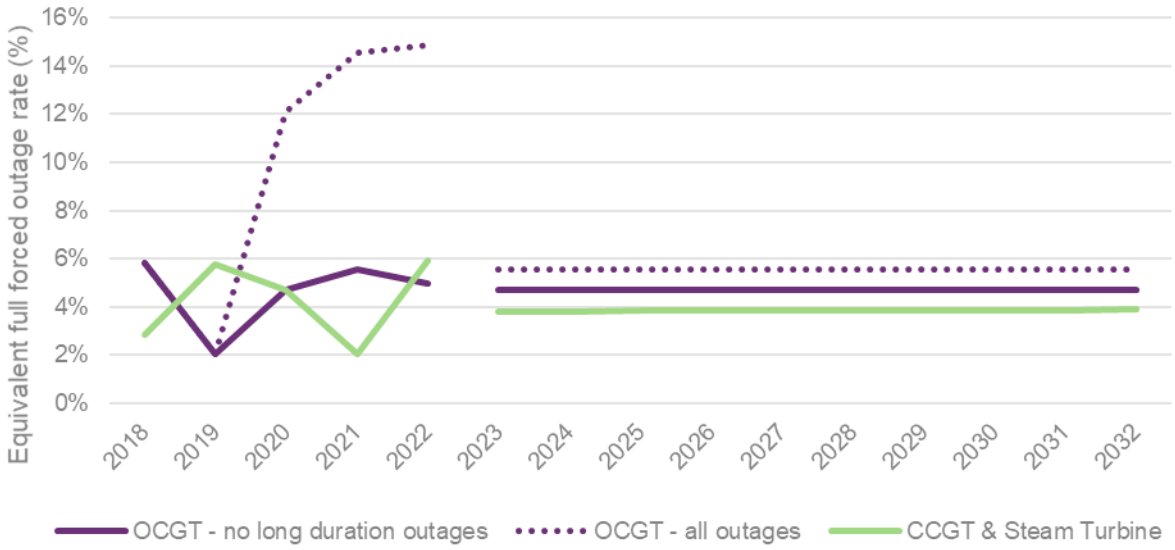
Steady outlook for Gas and Steam Turbines Forced Outage Rates

Based on updated calculations, predominantly derived from history:

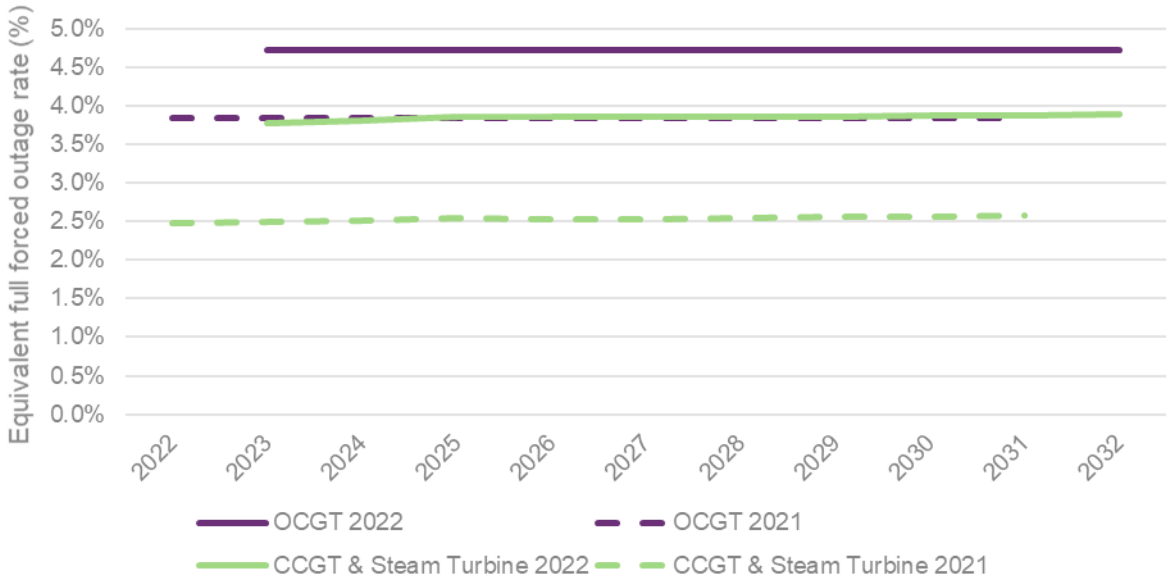
OCGT projections have increased against the 2021 ESOO, reflecting recent performance.

Steam Turbine and CCGT projections have increased against the 2021 ESOO, reflecting recent performance.

OCGT, CCGT and Steam Turbine EFOR actuals & forecasts



Comparison of 2022 and 2021 EFOR forecasts (no long duration outages)



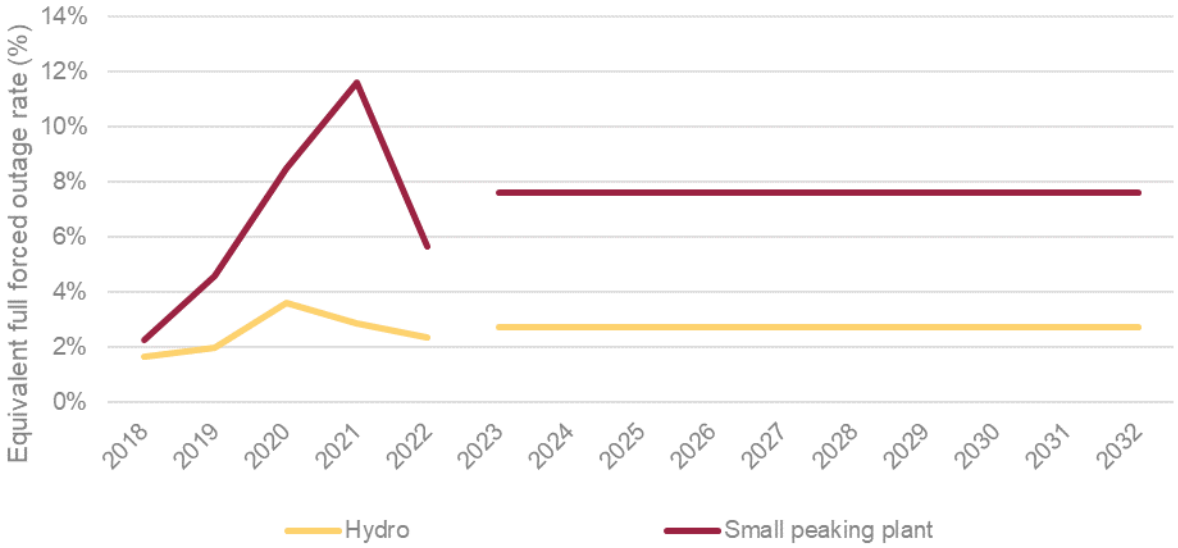
Hydro and Small Peaking Plant Forced Outage Rates developed on agreed methodology

Based on updated calculations, entirely derived from history :

Hydro projections have not materially changed.

Small peaking plant projections have increased against the 2021 ESOO, reflecting recent performance.

Hydro and Small peaking plant EFOR actuals & forecasts



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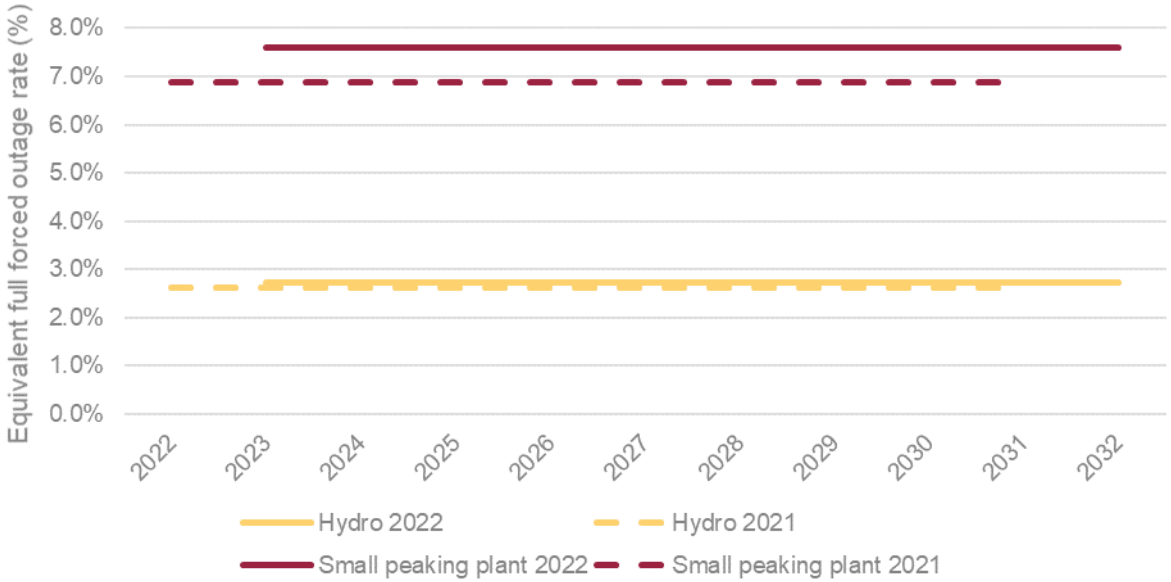

Exclusion of planned outages

- The methodology for calculating generator forced outage rates, excludes observed and projected planned outages.
- In recent years, emergency planned outages have emerged more frequently, sometimes impacting reserve availability.
- In these cases, an outage is planned on very short notice, and is often not schedulable.
- While collecting data, some participants advised that this category should be included in future assessments.

Transmission flow paths considered in 2022

- Liddell – Muswellbrook – Tamworth – Armidale – Dumaresq – Bulli Creek
- Murraylink
- Mortlake – Heywood – South East
- Basslink

Transmission unplanned outage rate method

- AEMO collected historical data on the occurrence of single credible contingencies from Network Service Providers, and/or AEMO datasets.
- AEMO collected and filtered reclassification events to exclude events that could be identified as having occurred in response to a multiple or non-credible contingency event.
- Long duration events are included in the historic dataset.
- Rates were developed using the full history available for each flow path.

Transmission lines selected, and calculated rates follow the methodology agreed earlier in 2022

Flow Path	Single credible contingency outage rate (%)	Reclassification outage rate (%)	Total outage rate (%)	Mean time to repair (hours)
Liddell – Muswellbrook-Tamworth-Armidale-Dumaresq-Bulli Creek (QNI)	0.2%	1.2%	1.4%	5.0
Murraylink	0.1%	0.0%	0.1%	8.9
Mortlake – Heywood – South East (Heywood)	0.1%	0.2%	0.3%	20.1
Basslink	5.9%	0.4%	6.3%	244.0

The constraints that will be applied when these outages are triggered reflect operational constraints that would apply during a single credible contingency event on the transmission segment most representative of the flow path's interconnector.

In 2022, all flow paths will use annual static forced outage rates over all forecast years.

Questions for consultation

- Has AEMO correctly applied its generation forced outage rate methodology?
- Has AEMO correctly applied its transmission unplanned outage rate methodology?
- Should AEMO amend the generator FOR methodology in future years to collect and include emergency planned outages?
- Are there any other factors AEMO should consider in future assessments?