# 2023-24 Summer Demand Review

April 2024 FRG Meeting

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# Purpose and agenda

## Purpose

- *Informing* the FRG on the forecast accuracy of AEMO's 2023 Electricity Statement of Opportunities (ESOO) maximum and minimum demand forecasts for summer 2023-24 (November 2023 – March 2024).

## Agenda

- How we measure maximum and minimum demand
- Explaining Probabilities of Exceedance (POEs)
- Results overview
- Australia's Summer 2023-2024 Climates
- Unpacking how maximum demand is achieved
- Explaining each region's results for maximum and minimum demand

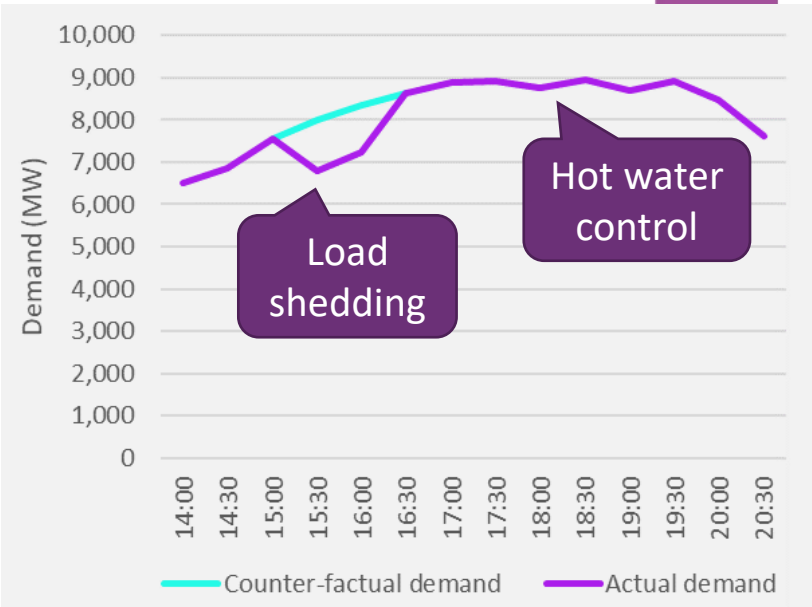
| Timing | Relevant topic | Responsible |
|---|---|---|
| Aug 2023 | 2023 ESOO publication | AEMO, FRG |
| Nov 23-Feb 24 | Forecast Accuracy Report/Forecast Improvement Plan (FIP) consultation | AEMO, Stakeholders |
| **Today** | **Summer 2023-24 demand review** | **AEMO** |
| Aug 2024 | 2024 ESOO Publication | AEMO |

# Measuring maximum and minimum demand

AEMO's maximum and minimum demand forecasts represent forecast demand in the absence of:

- Directed load shedding
- Network outages
- Mandatory restriction schemes in effect
- Call for voluntary reduction in demand
- Demand side participation (DSP) including any under RERT

It does account for daily operation of load control, such as timer controlled hot water, or ripple controlled hot water/pool pump loads.




Any load shedding or atypical reduction in demand should be added back to the actual demand (counterfactual) when comparing with the forecast. For peak demand days, any such adjustments are accounted for and documented in the annual Forecast Accuracy Report.

Note that "demand" refers to the "sent out" definition (excluding generation auxiliary load) and is *half-hourly* average values.

Time reference is NEM-time (AEST) unless otherwise noted.

# Modelling maximum and minimum demand

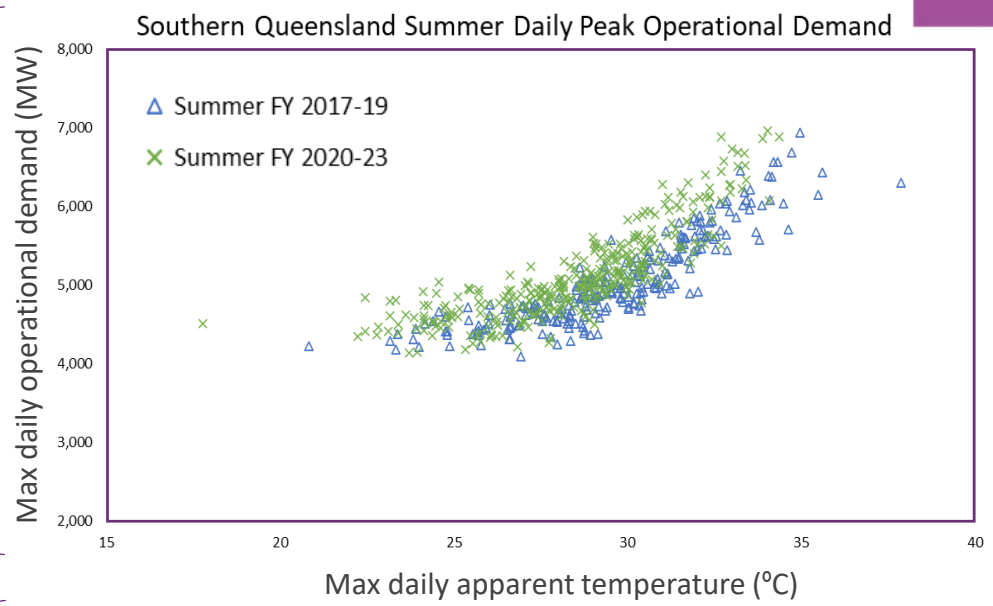
Maximum demand depends among other things on temperature*. The realised temperature outcomes differ from year to year.

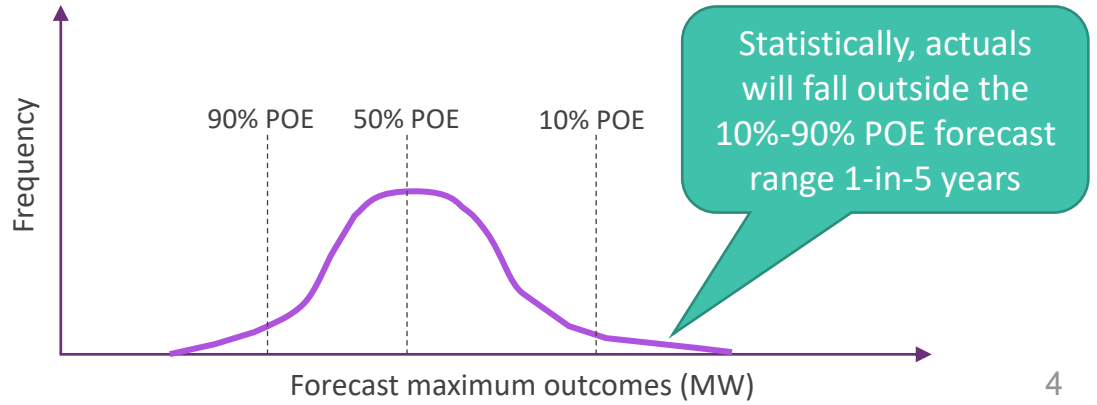
AEMO therefore applies a probabilistic forecast to account for difference in weather, among other things. This results in a forecast distribution of max (and min) demand outcomes.

AEMO publishes different points of the forecast distribution to stakeholders.

Typically, the 10%, 50% and 90% probability of exceedance (POE) values are provided. The 10% POE forecast represent a forecast value that only will be exceeded across the season with a probability of 10%.

* Minimum demand is temperature dependent too, typically occurring during weekends with high PV generation and mild weather, so without any significant cooling/heating load.



# Overview of max/min demand results

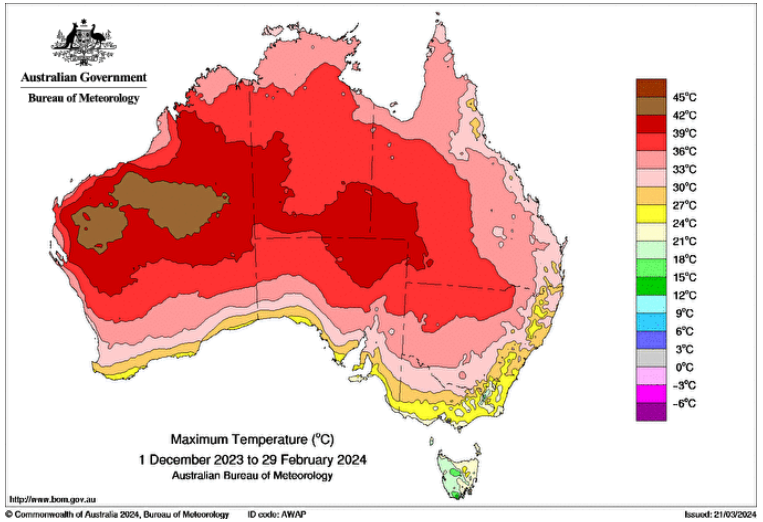
**Status as of 11 April 2024, compared with ESOO 2023 forecast**

| Region | Summer maximum | Summer minimum |
|---|---|---|
| Queensland | Above 10% POE | Between 50% and 10% POE |
| New South Wales | Between 50% and 10% POE | Just above 10% POE |
| Victoria | Between 90% and 50% POE | Just under 50% POE |
| South Australia | Between 90% and 50% POE | Between 50% and 10% POE |
| Tasmania | Just under 90% POE | Between 50% and 10% POE |
| Western Australia | Above 10% POE | Between 50% and 10% POE |

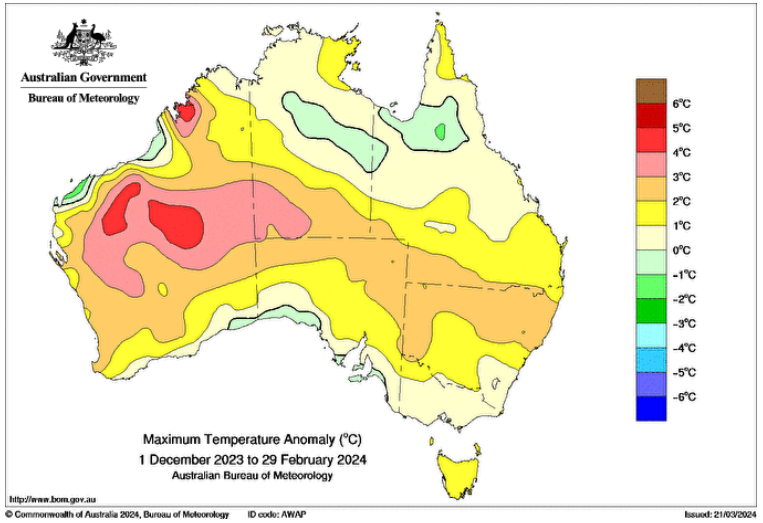
Note that green and red colours simply represent whether the forecast falls within the 10%-90% POE interval. Being red may not be due to input/model error, but due to more extreme drivers than usual.

# Australia’s Summer 2023-2024 Climate

- **Third Warmest Summer on Record:** Australia's third-warmest summer on record (since national observations began in 1910), 1.62 °C above the 1961-1990 average, marked by persistent and widespread heat.
- **Temperature Details:** The national mean maximum temperature was 1.73 °C above the 1961–1990 average for summer, while the national mean minimum temperature was 1.50 °C above average.
  - **Mean Maximums**: Above average in Tasmania, most of Western Australia, South Australia, New South Wales, Northern Territory, Queensland, and parts of Victoria.
  - **Mean Minimums**: Western Australia had its second-warmest summer mean minimum temperature on record, 1.34 °C above the 1961–1990 average. For the Northern Territory and Queensland, mean minimum temperatures this summer were third-warmest on record, and New South Wales, Victoria and Tasmania were all in their respective top ten warmest on record.
- **Bushfires**: Impacted southern Western Australia during summer; significant fires in western Victoria and central Tasmania in February.
- **Heatwaves**: Most of Australia was affected by heatwaves in December and February.



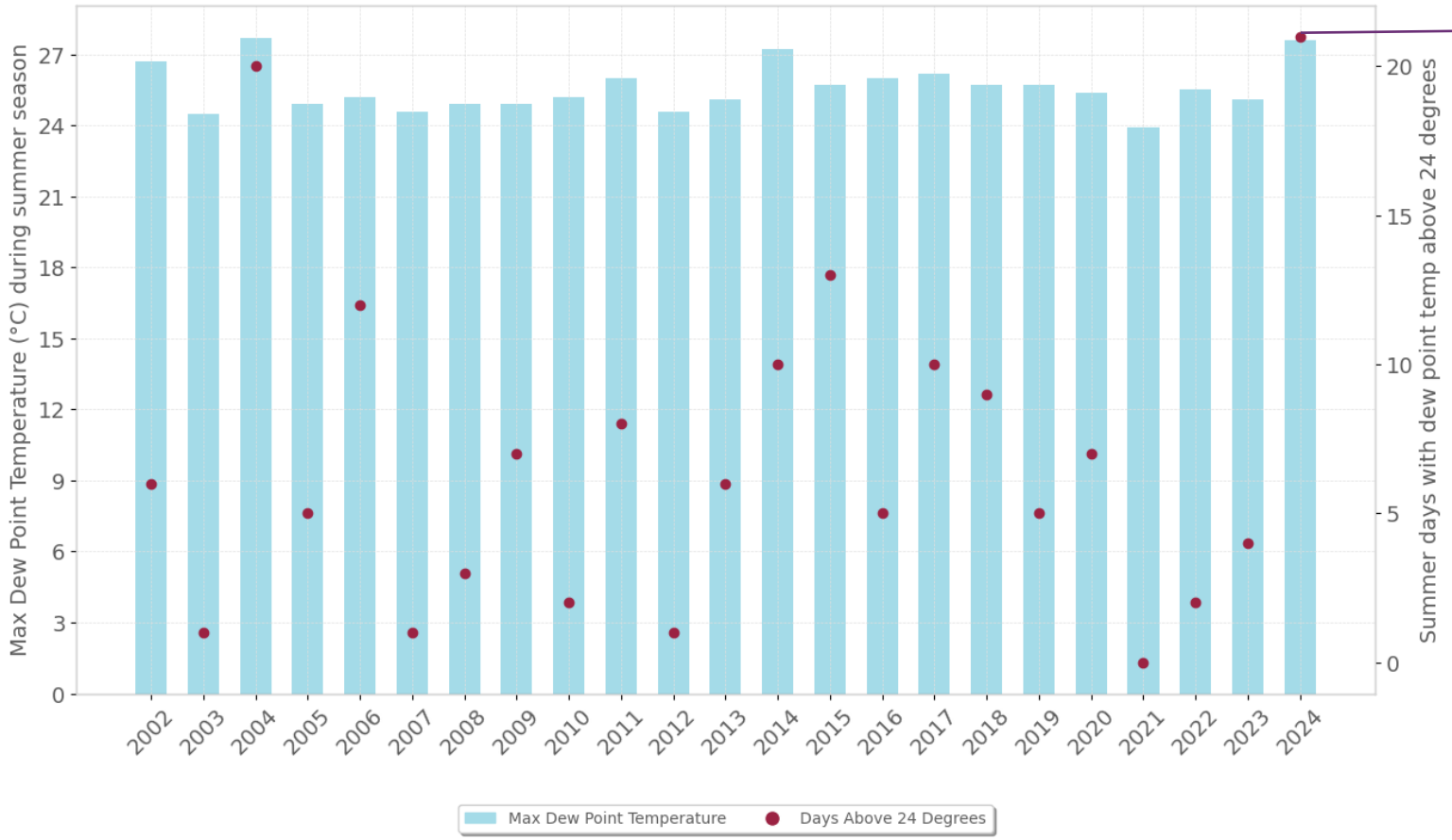

Maximum Temperature Map




Maximum Temperature Anomaly Map

# Example: QLD faced an unusual summer

Brisbane Airport– Dew Point Temperature outcomes 1 November till 28 February (2002-2024)




This was on track for a demand outcome higher than 10% POE

| Dew point temp. (°C) | How it feels |
|---|---|
| >24 | Oppressive, uncomfortable for most, possible heat stress issues |
| 20-24 | Muggy, quite uncomfortable |
| 15-20 | Starting to feel muggy, though still comfortable for most |
| 10-15 | Comfortable |
| 5-10 | Dry |
| <5 | Very dry |

*Dew point description by BOM*

# Things that must align for a high demand outcome…

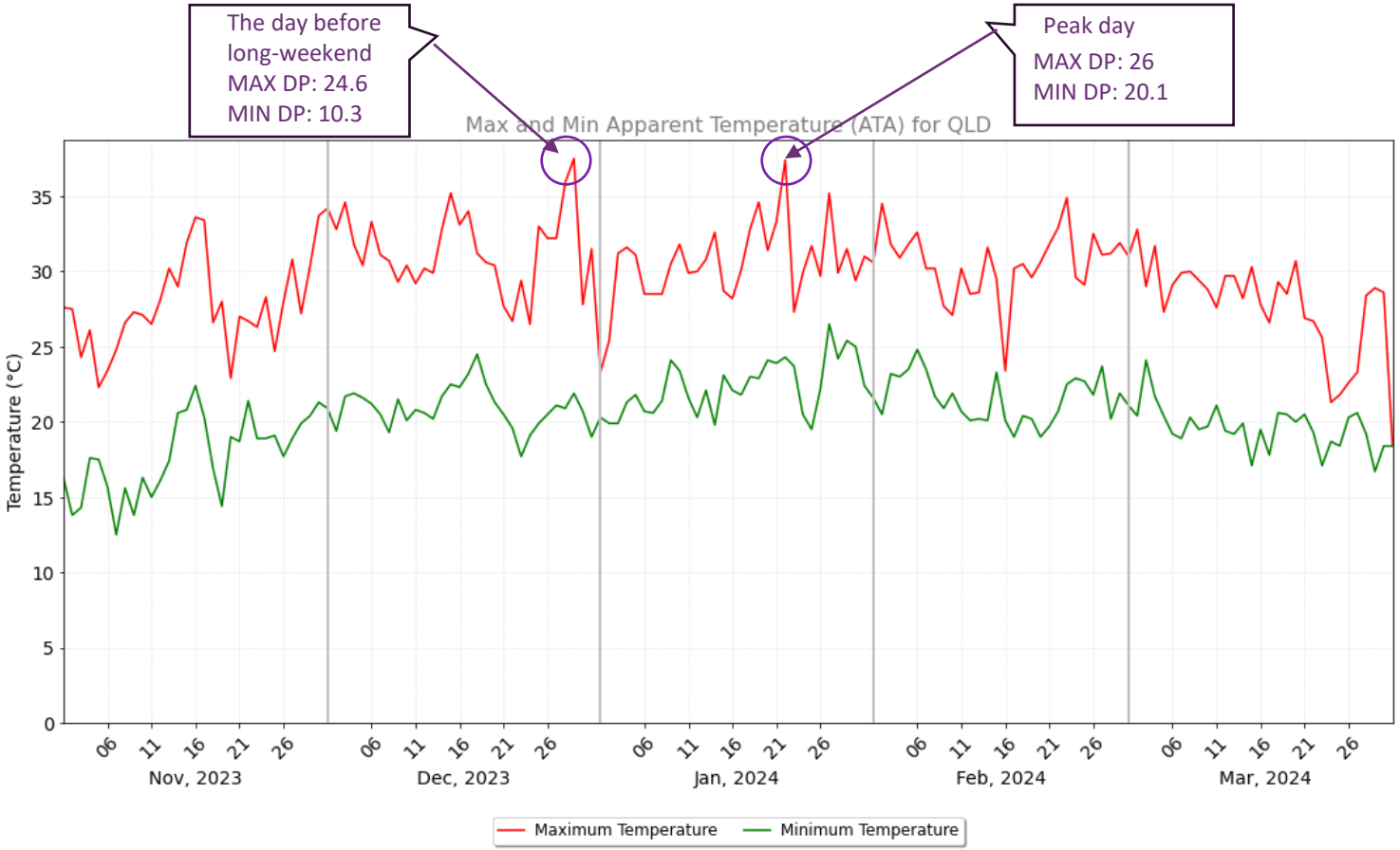
- Hot weather days (cold for winter max)
- Extended heatwave conditions giving little relief/cooling between days (cold snaps for winter max)
- High humidity (wind chill for winter max)
- PV generation lower than usual
- Business day
- Consumer behaviours that preferences electricity use

For each of these events, there is a chance they fall at a time that results in higher demand.

# Queensland

| Max/min | 10% POE | 50% POE | 90% POE | Actual |
|---|---|---|---|---|
| Max | 10373 | 9932 | 9439 | **10575** |
| Min | 3718 | 3488 | 3180 | **3678** |

| Factor | Check |
|---|---|
| Hot day | **Yes** |
| Extended period of hot weather | **Partial** |
| High humidity | **Yes** |
| Low PV outcome | **Yes** |
| Weekday | **Yes** |
| Non-holiday | **Yes** |
| Consumer behaviour | **?** |

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| 5-10 | Dry |
| <5 | Very dry |

*Dew point description by BOM*

# Tasmania

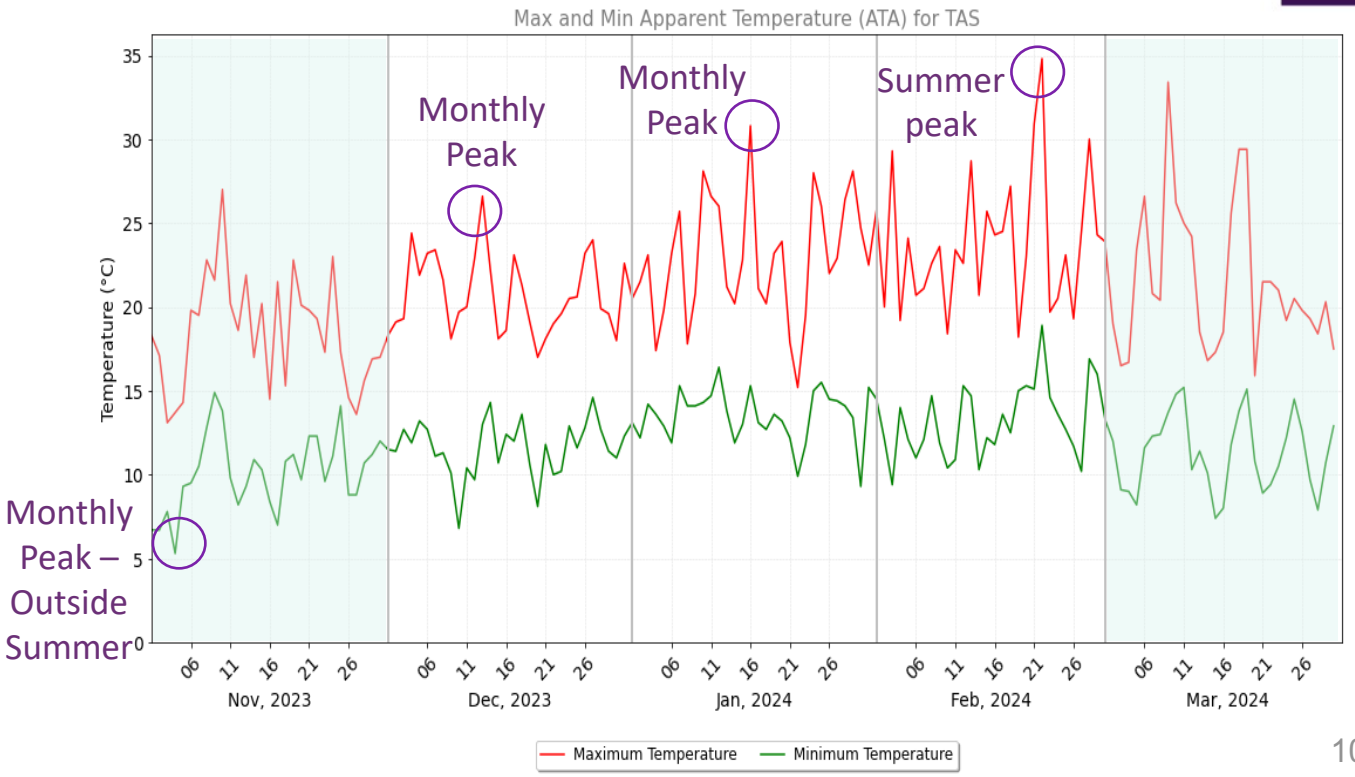
| Max/min | 10% POE | 50% POE | 90% POE | Actual |
|---|---|---|---|---|
| Max | 1438 | 1396 | 1363 | **1308** |
| Min | 900 | 868 | 831 | **854** |

| Factor | Check |
|---|---|
| Cold day | **No** |
| Extended period of cold weather | **No** |
| High humidity | **n/a** |
| Low PV outcome | **Yes** |
| Weekday | **Yes** |
| Non-holiday | **Yes** |
| Consumer behaviour | **?** |

- Generally, weather is less impactful in Tasmania as large industrial load (LIL) accounts for approximately ~60% of total consumption.
- This year, the correlation between temperature and peak demand is more noticeable. In particular, the peak demand coincided with the highest temperature day of summer. The peak demand happened 22nd of Feb at 5:30 pm driven by hot weather. It fell outside of the 90% POE .
- In December 2023, and January 2024 the monthly peak matched the hottest day of the month, while in November 2023, it aligned with the coldest day of the month.

| Date | 03 Nov | 13 Dec | 15 Jan | 22 Feb |
|---|---|---|---|---|
| LIL at time of peak (MW) | 716.4 | 728 | 738.2 | 695.7 |
| OPSO at time of peak (MW) | 1323 | 1250 | 1256 | 1308 |

- Minimum demand fell within the forecast range.

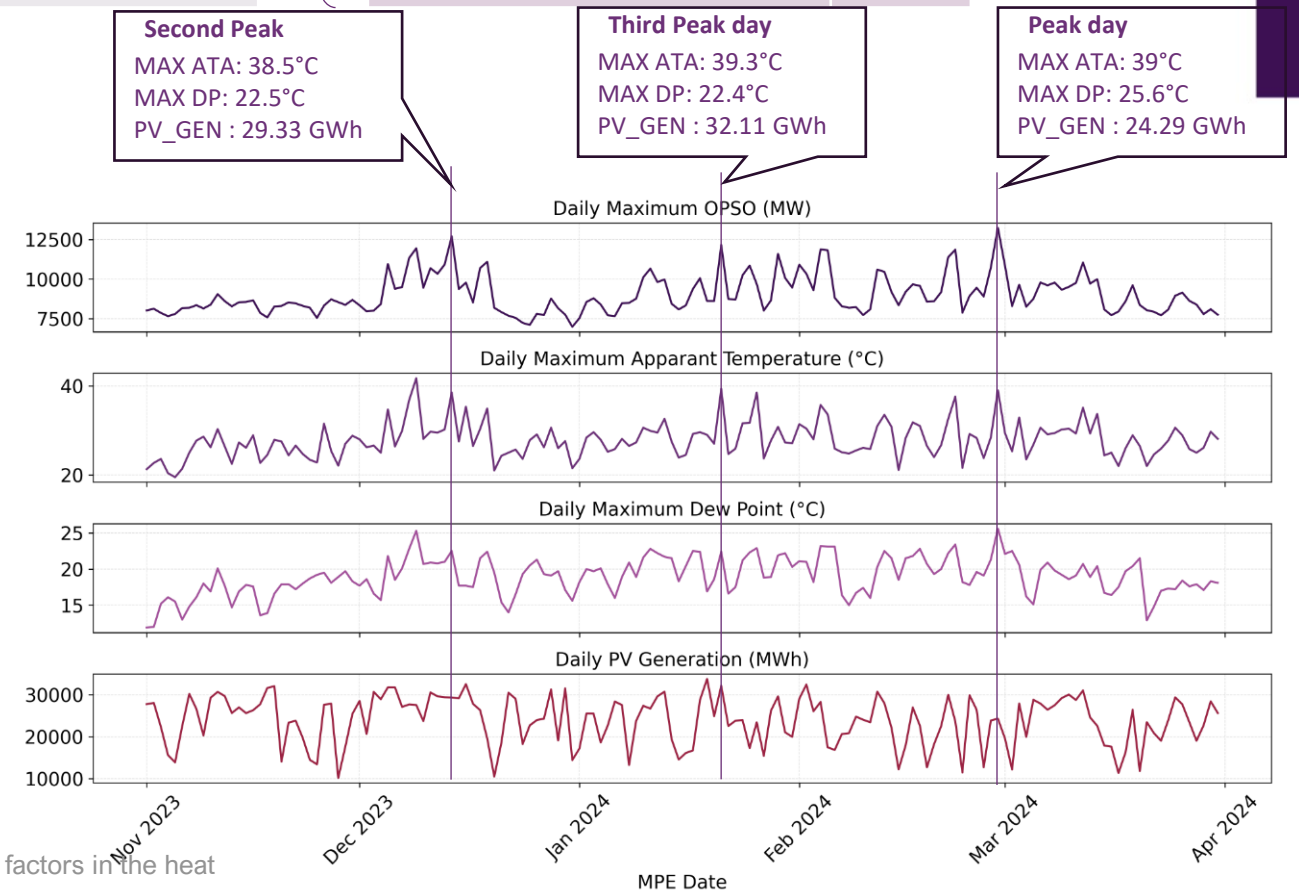


# New South Wales

| Max/min | 10% POE | 50% POE | 90% POE | Actual |
|---|---|---|---|---|
| Max | 13822 | 12799 | 11555 | 13239 |
| Min | 3906 | 3584 | 3342 | 3922 |

| Factor | Check |
|---|---|
| Hot day | Yes |
| Extended period of hot weather | No |
| High humidity | Yes |
| Low PV outcome | Yes |
| Weekday | Yes |
| Non-holiday | Yes |
| Consumer behaviour | ? |

- Experienced 9 days with temperatures above 35°C.
- Maximum demand recorded on 29th February, with temperatures reaching 39°C.
- This was the 3rd hottest day of the summer and the hottest weekday.
- Peak demand coincided with high humidity; dew point reached 25.6 at Bankstown Airport AWS.
- Observed a low PV outcome on high temperature days, noted as the "Russ Christ Effect."
- Minimum demand on Sunday, 19th November, was slightly higher than the 10% POE forecast.
- This is noteworthy but not a significant concern for annual trends, will inform the 2024 ESOO forecast.

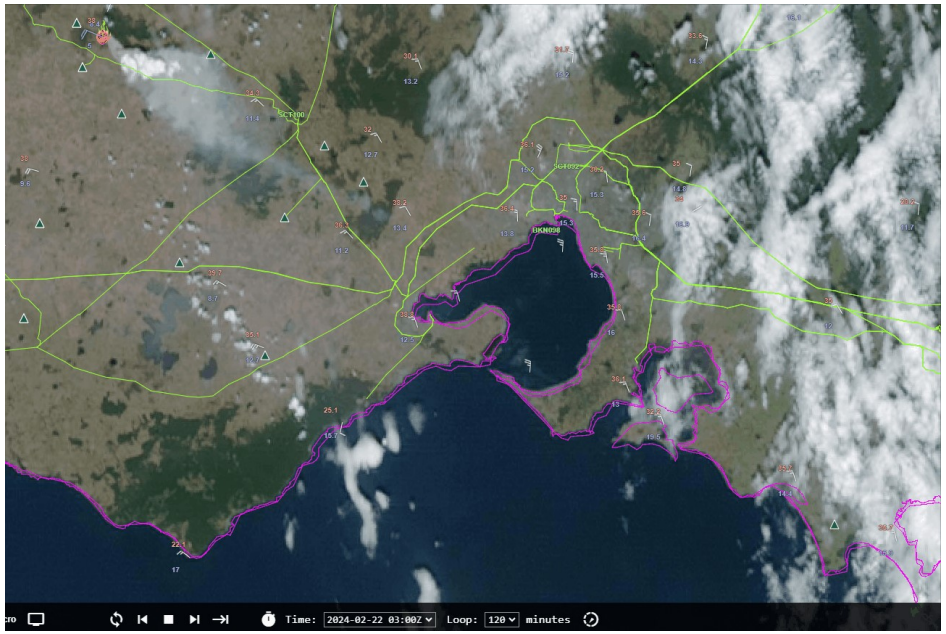


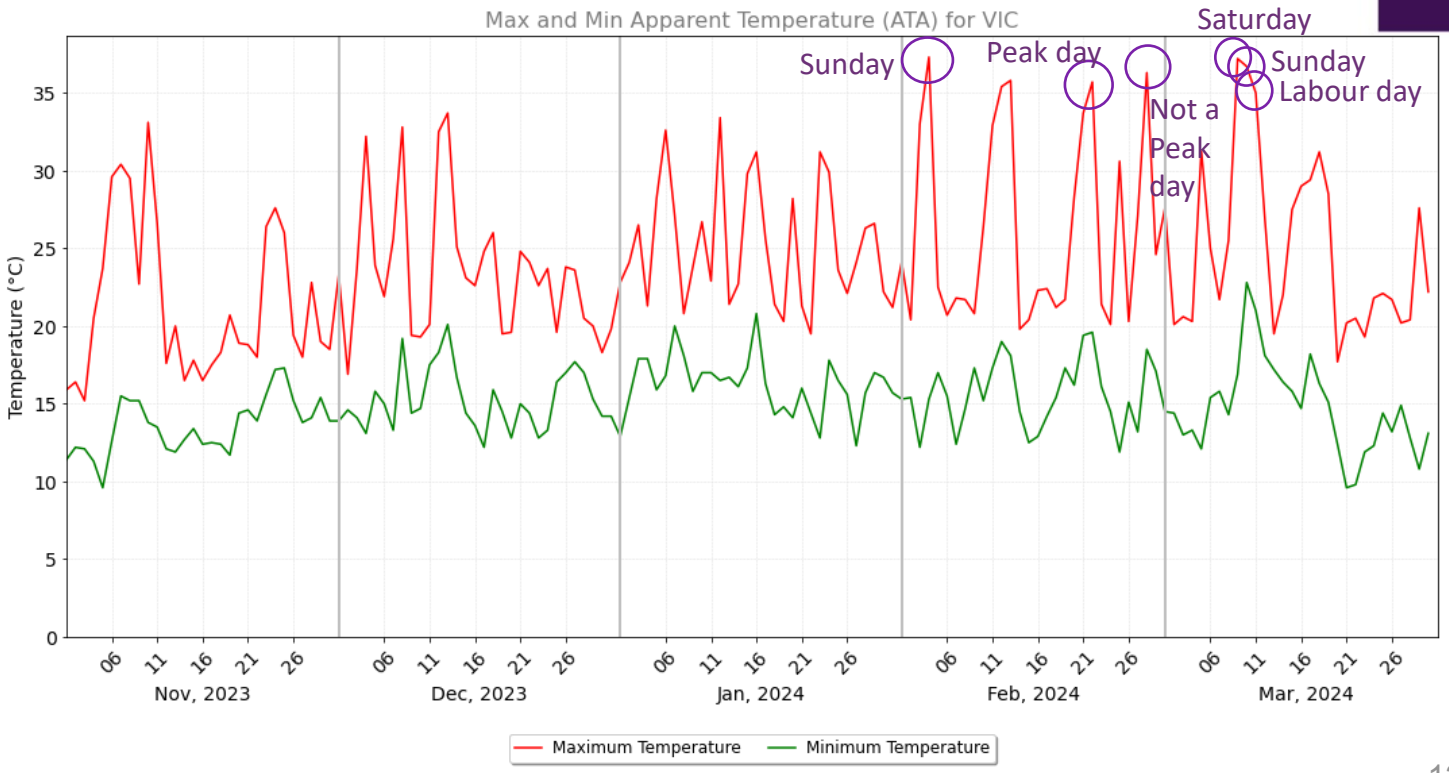

ATA: Apparent Temperature (The temperature perceived by humans)
DP : the temperature point at which the air can hold no more water (water vapor) and is one of the factors in the heat index

# Victoria

| Max/min | 10% POE | 50% POE | 90% POE | Actual |
|---|---|---|---|---|
| Max | 10177 | 9369 | 8403 | 8947 |
| Min | 1590 | 1446 | 1287 | 1407 |

| Factor | Check |
|---|---|
| Hot day | Yes |
| Extended period of hot weather | Partial |
| High humidity | Partial |
| Low PV outcome | Yes |
| Weekday | Yes |
| Non-holiday | Yes |
| Consumer behaviour | ? |



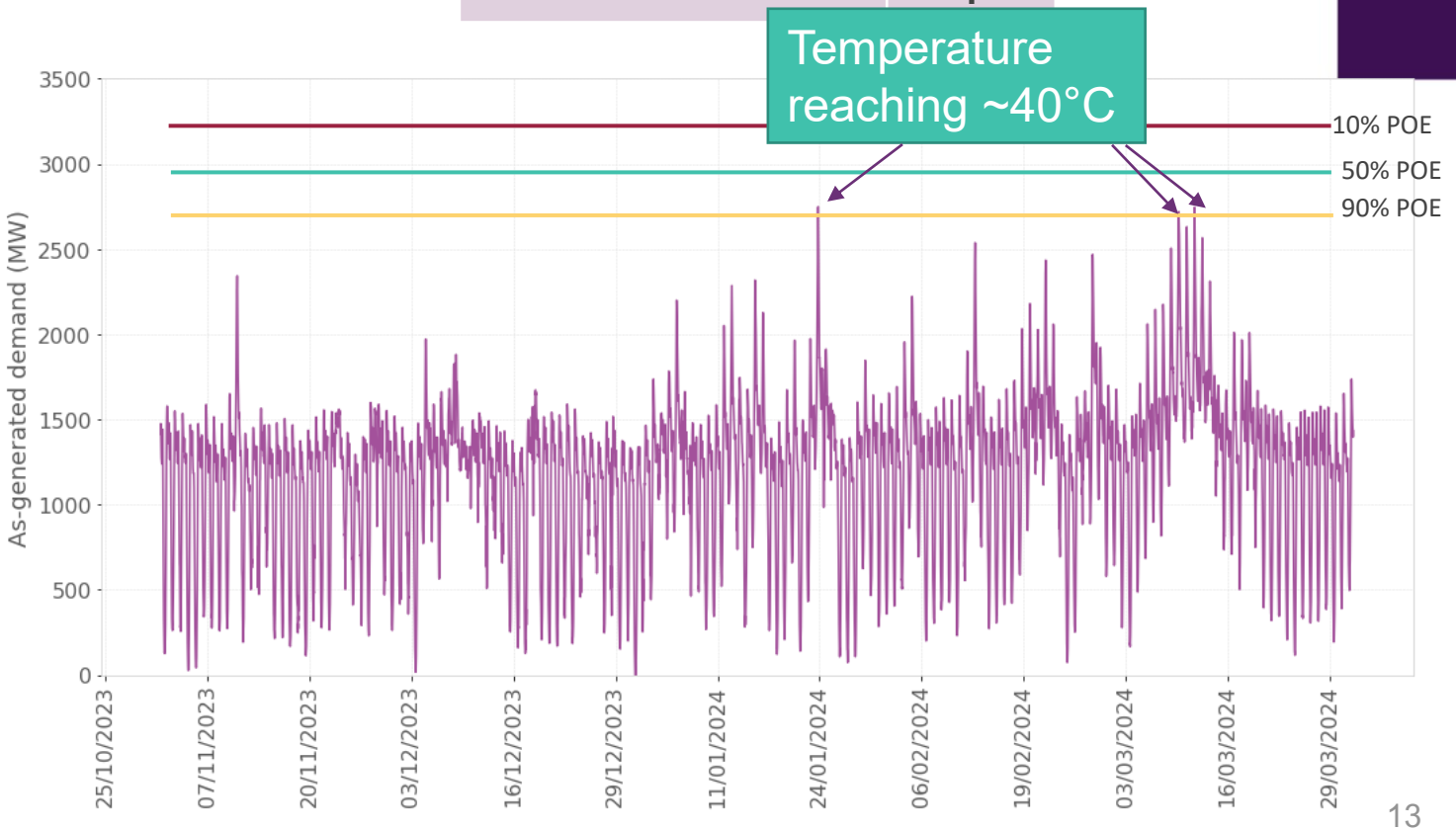


# South Australia

| Max/min | 10% POE | 50% POE | 90% POE | Actual |
|---|---|---|---|---|
| Max | 3317 | 2922 | 2734 | 2748 |
| Min | -16 | -71 | -130 | -30 |

| Factor | Check |
|---|---|
| Hot day | Yes |
| Extended period of hot weather | partial |
| High humidity | No |
| Low PV outcome | No |
| Weekday | Yes |
| Non-holiday | Yes |
| Consumer behaviour | ? |

- Generally, a hot summer in South Australia (state's seventh-warmest summer on record since 1910)
- Maximum demand occurred on 23rd January (Tuesday) at 7.30pm just above 90% POE
  - Warmest day throughout the (40.1°C)
- Minimum demand occurred on the 31th December (Sunday) at 1.30 pm above 50% POE



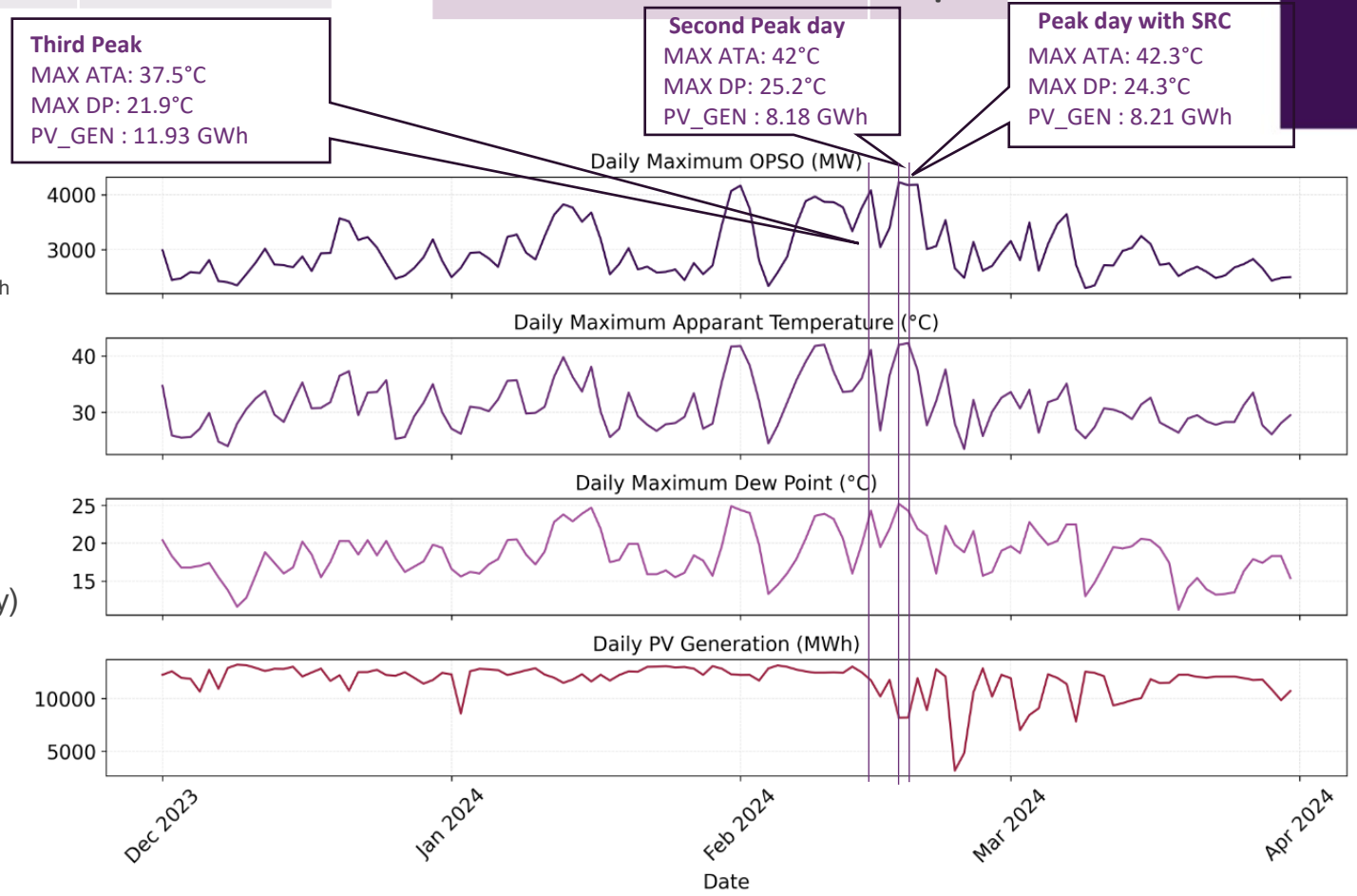
# Western Australia

| Max/min | 10% POE | 50% POE | 90% POE | Actual |
|---|---|---|---|---|
| Max | 4254 | 4003 | 3736 | SRC/DSP/ off-market 4334 |
| Min | 754 | 705 | 647 | 730 |

| Factor | Check |
|---|---|
| Hot day | Yes |
| Extended period of hot weather | Yes |
| High humidity | Yes |
| Low PV outcome | Yes |
| Weekday | Yes |
| Non-holiday | Yes |
| Consumer behaviour | ? |

- Western Australia had an extreme hot summer
  - 27 days above 35°C (9 days at or above 40°C)
  - Humid summer
  - Maximum temperature during summer was 42.3°C (around Perth CBD)
- Peak demand adjusted for estimated load reduction was occurred on 19th February at 5.30-6pm with a level of 4334 MW
  - Maximum temperature 42.3°C
  - Maximum dew point temperature was 24.3°C
  - Low PV outcome
  - Extended heatwave
- Observed peak demand (4228 MW) is 106MW less than the adjusted peak demand and occurred between 5.30-6pm on 18th February (Sunday)
- Minimum demand occurred on the 9th March (Saturday) at 1pm and fell within our forecast range.

SRC: Supplementary Reserve Capacity
ATA: Apparent Temperature (The temperature perceived by humans)
DP : the temperature point at which the air can hold no more water (water vapor) and is one of the factors in the heat index



# Next steps

- Apply learnings to ESOO 2024 forecast
- Draft ESOO maximum and minimum demand forecasts will be presented at the June FRG

- Do you have any questions?

AEMO

AUSTRALIAN ENERGY MARKET OPERATOR

For more information visit

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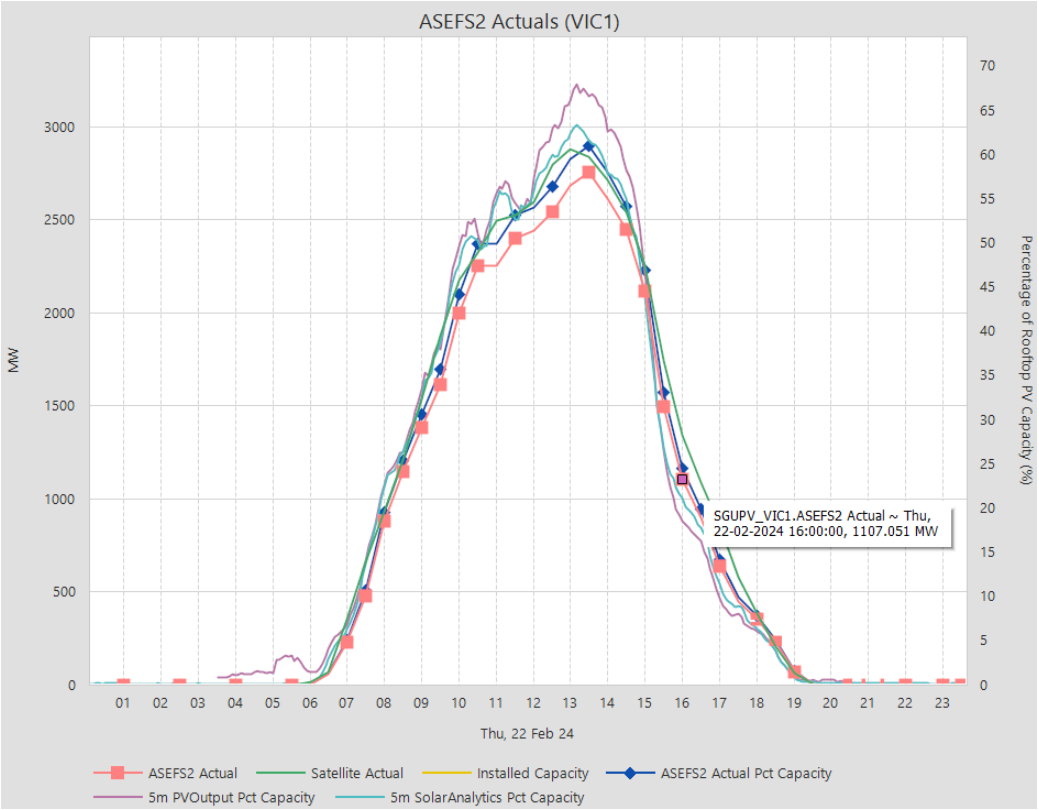
# Appendix

Rooftop PV Generation on 22 Feb 2024, in VIC