

# Demand traces – why change?

29 September 2021 FRG Meeting

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# Background and Purpose

This presentation describes the rationale for improving Demand Traces, and seeks stakeholder feedback. AEMO will also capture feedback about what is needed from the Demand Trace process.

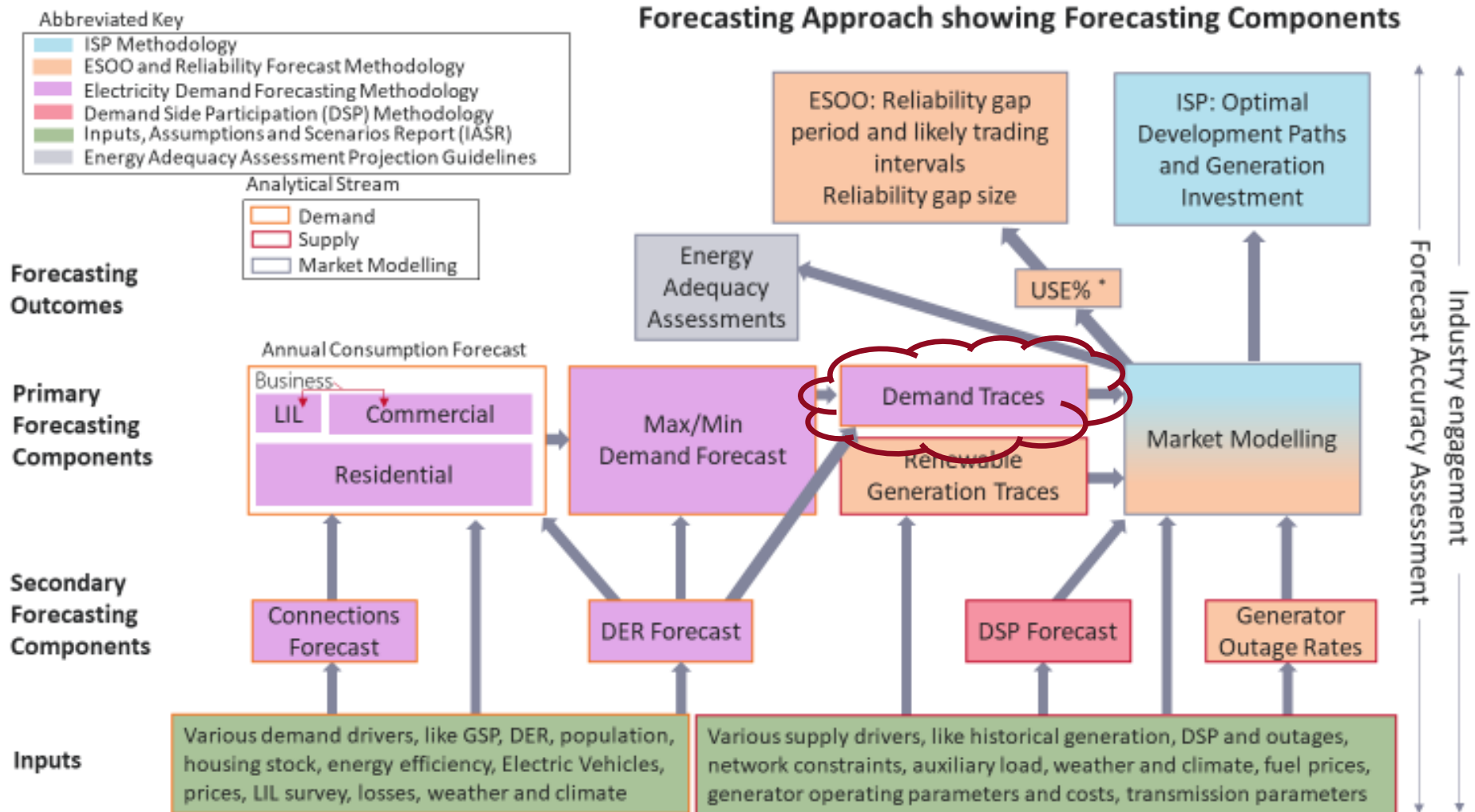
## Engagement timeline

FRG Timing	Details
Oct 2020	Forecasting Enhancement Research Project
July 2021	2020 Forecast Improvement Plan progress update
Aug 2021	Forecasting research initiatives
Today	<b>Demand Traces – the why</b>
Oct 2021	2021 Forecast Accuracy Report with draft Forecast Improvement Plan

## Today's agenda:

- Recap – what are demand traces (see previous presentation)
- Recap – the journey
- Today's scope
- Demand trace challenges:
  - Mild-year syndrome
  - Emerging needs driven by the changing energy system
- Revisit: what do we want from Demand Traces?
- Discussion

# Demand trace generation is pivotal, complex, and sits amidst emerging challenges and opportunities

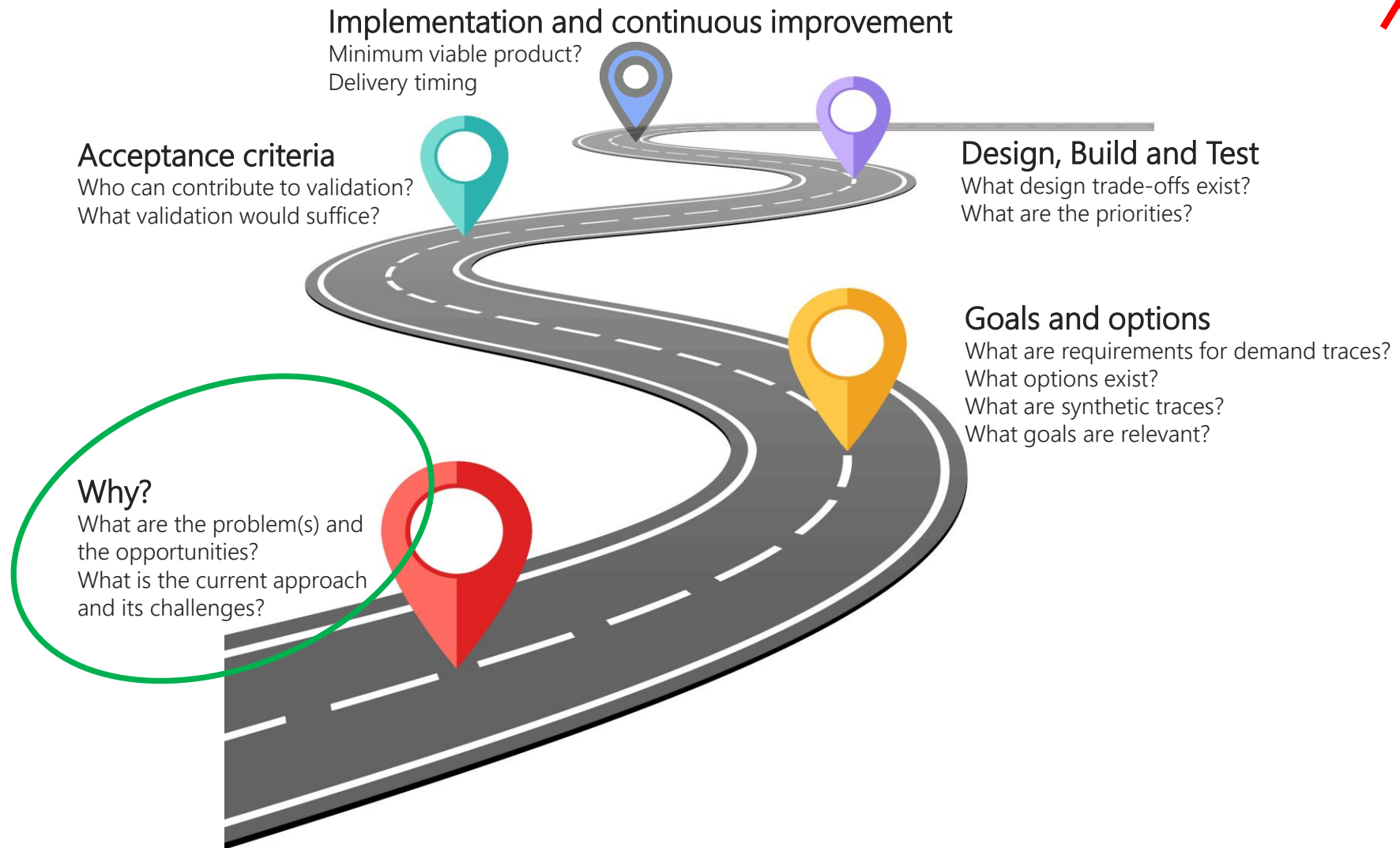


\* See also Reliability Standard Implementation Guidelines

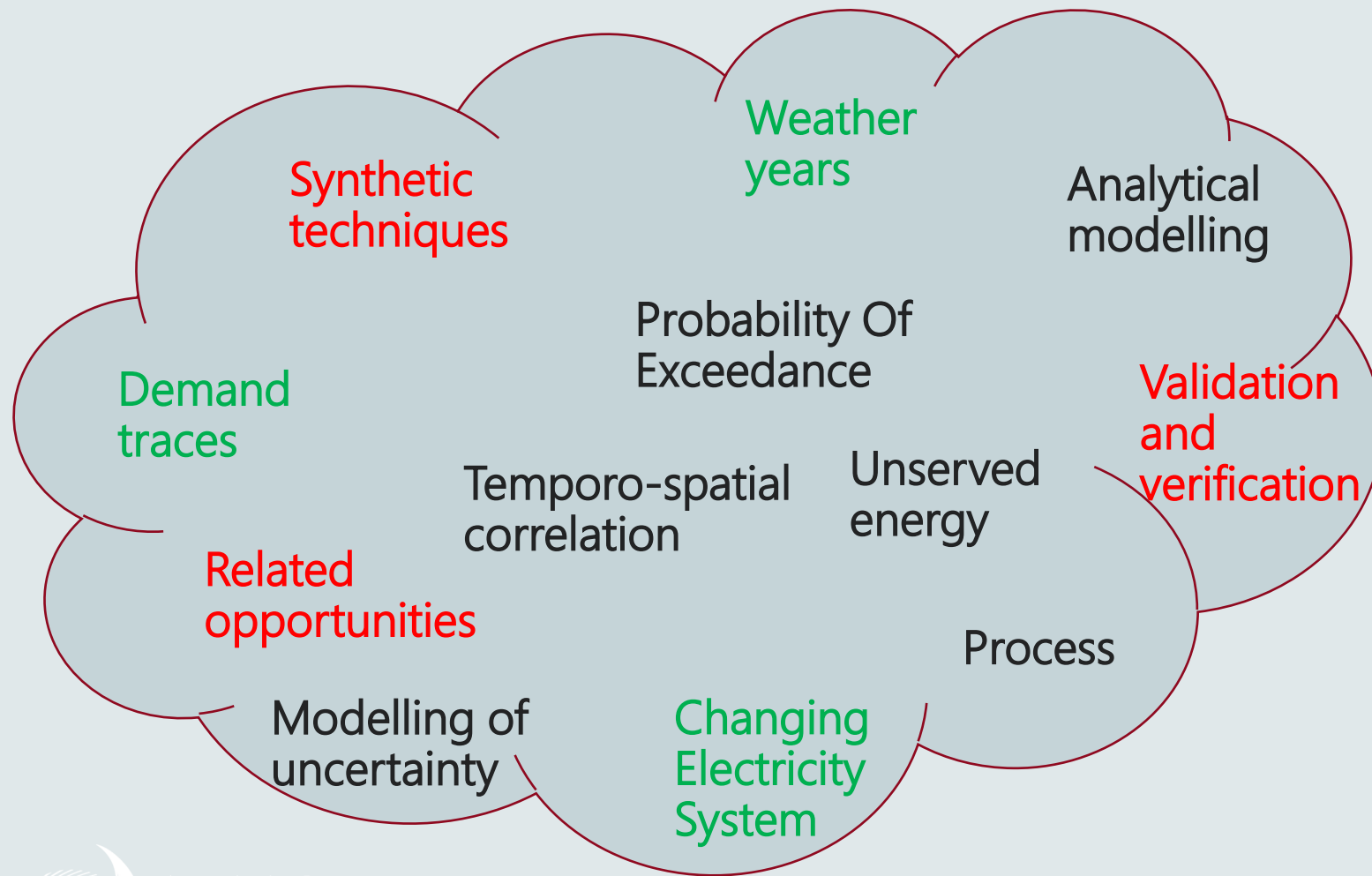
Recap

# How might AEMO and the FRG best address demand trace generation challenges and opportunities?

Recap



# Today's scope



- In scope today
- Discussed if required
- Out of scope today

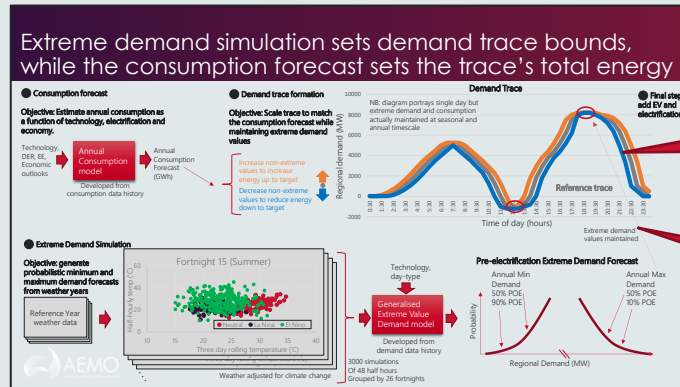


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# Demand trace challenges: emerging needs driven from the changing energy system

## Demand trace process



### Historical expectations of output:

- Designed for max demand and determining unserved energy
- Useful for peak season

### Emerging expectations of output:

- Also suitable for min demand
- Useful for both peak and shoulder seasons

Need for additional weather years to better reflect possible supply/demand interactions

## Changing energy system

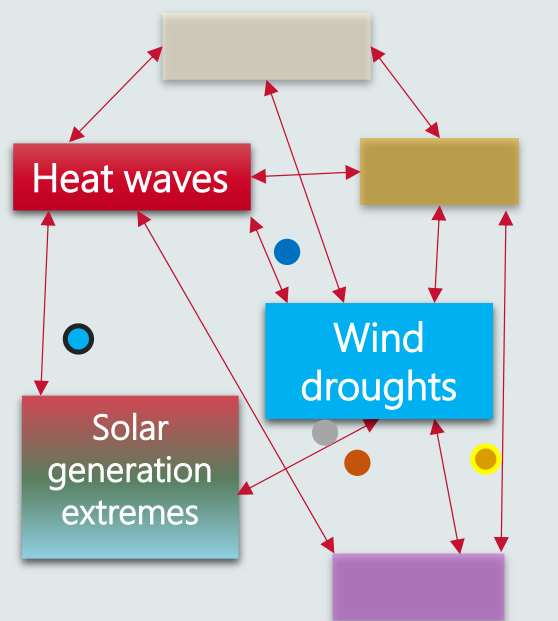
- Minimum demand more important as PV grows
- Thermal generators and transmission outages in shoulder season lead to potential for shoulder season capacity shortages
- Winter demand may rise with electrification, and summer may get longer due to climate change, so available shoulder season for outages shrinks
- Increased reliance on variable renewable generation to meet demand as thermal plant retire





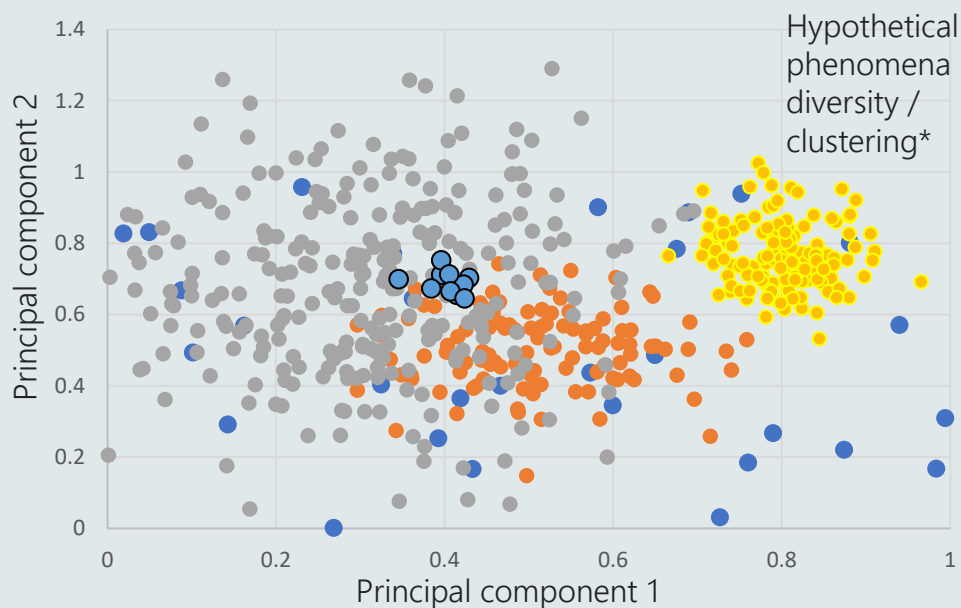
# Demand trace challenges: the available reference years are insufficient to capture the full range of weather diversity

Real world phenomena and their correlations...



Positive and negative correlations

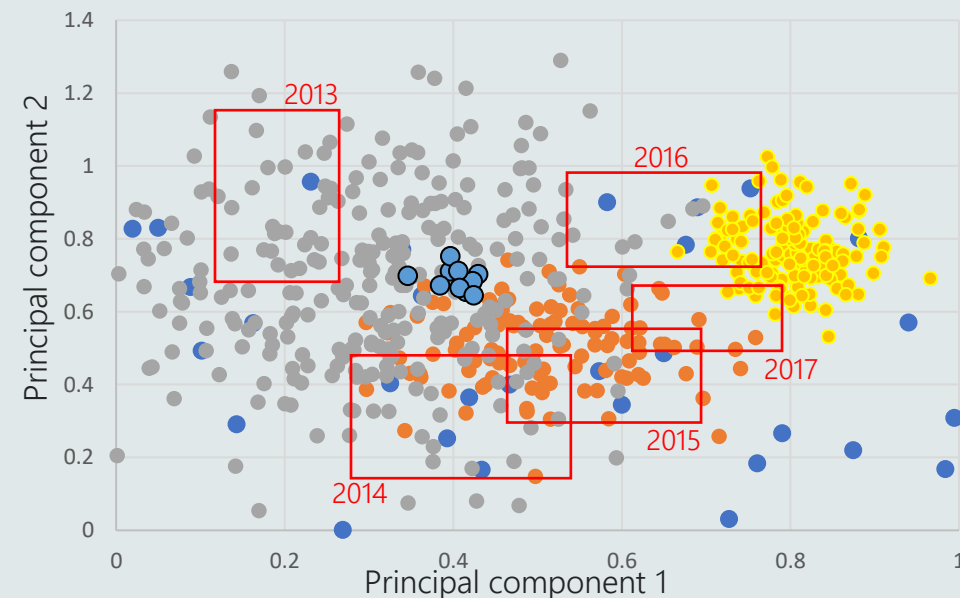
... drive an incredibly diverse range of potential combinations...



● Hot and windy  
● Wind drought, low solar  
● High temperature, low solar

● High wind low solar  
● Rain and cold

... of which only some will be sampled with the currently available set of 10 reference years



In this illustration, a particular combination (●) does not occur within the available reference years

\* Principal component analysis graphs draws out key diversity in high dimensionality data

Capturing a broader set of phenomena is increasingly important as the energy system moves towards 100% instantaneous penetration of Variable Renewable Energy (VRE).



# What do AEMO and stakeholders want from demand traces?

Updated and seeking further input

What characteristics are we seeking from current and future demand traces?

- Account for demand generated from weather patterns
  - Both current and future weather patterns
  - Use many more weather years (and corresponding demand traces) in **reliability** forecasts
- Account for temporal demand drivers (day of week, time of day, trend)
  - As affected by new technologies, electrification, etc.

Incorporation of correlation between demand, renewable generation and time. Also, spatially between neighbouring regions.



Traces should allow for:

- Calculation of unserved energy in the subsequent market modelling, allowing:
  - Assessment of whether reliability standard is met
  - Identification of problematic timing of generator or network outages
- **Minimum demand analysis, especially for system security assessment**
- Identification of scenario-specific future generation and transmission expansion requirements
  - Assessment of timing and economics of network investments
- What-if studies, such as:
  - High inverter based instantaneous penetration (mainland NEM) – frequency and duration
  - Ramping events
  - Low coincident renewable generation events such as wind droughts

Will trace approach deliver?

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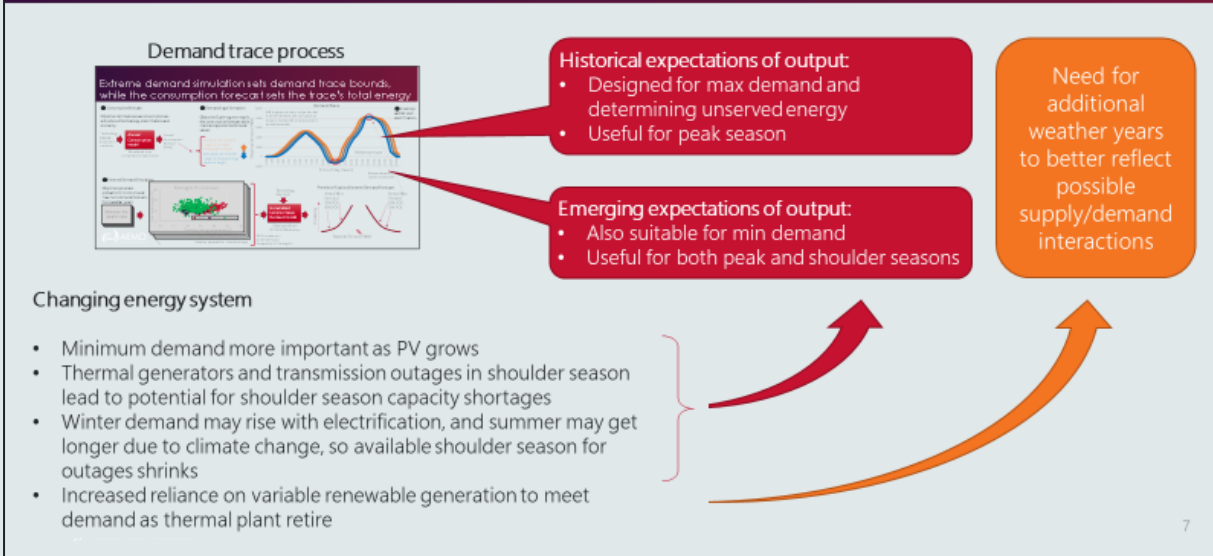
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Key: **Updated**

# Discussion

## Demand trace challenges: emerging needs driven from the changing energy system



Are there any other Demand Trace requirements to be considered?

Does this slide capture the emerging needs as the energy system changes?

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