

Forecasting Reference Group (FRG) DRAFT MINUTES

MEETING: FRG #6 2021
 DATE: Wednesday, 30 June 2021
 TIME: 2:00pm – 4:55pm AEST
 LOCATION: Teleconference

ATTENDEES:

Name	Company	Name	Company
Ben Skinner	AEC	Ngoc Tho	ElectraNet
Katy Brady	AEMC	Dennis Van Puyvelde	Energy Networks Australia
Lucy Mendoza	AEMC	Jill Cainey	Energy Networks Australia
Abbas Mohammadi	AEMO	Candice Hincksman	Energy Queensland
Adrian Grantham	AEMO	Anna Hancock	EnergyAustralia
Ali Habib Khalaj	AEMO	Lawrence Irlam	EnergyAustralia
Andrew Turley	AEMO	Patrick Gan	EnergyAustralia
Azadeh Keshavarzmohammadian	AEMO	Sandy Xu	Engie
Bella Pennington	AEMO	Brent Hudson	Essential Energy
Ben Jones	AEMO	Zoe Dowsett	Essential Energy
Ben Tudman	AEMO	Richard Hickling	GHD
Cam Potter	AEMO	Christina Sutherland	GLNG Operations
Carla Ziser	AEMO	Andrew Nance	ISP Consumer Panel
Cristina Rocca	AEMO	Mark Grenning	ISP Consumer Panel
Dane Winch	AEMO	Richard Owens	ISP Consumer Panel
Daniel Collins	AEMO	Stephanie Bashir	ISP Consumer Panel
Daniel Guppy	AEMO	John Cheong-Holdaway	Jemena
Dean Soste	AEMO	David Headberry	Major Energy Users
Deborah Marsh	AEMO	Bill Nixey	NSW DPIE
Faranak Golestaneh	AEMO	Sharon Young	NSW DPIE
Greg Staib	AEMO	Shira Samocha	NSW DPIE
Joachim Tan	AEMO	Sarah-Jane Derby	Origin
Ken Harper	AEMO	Anna Livsey	PIAC
Kent Hanh	AEMO	Enrique Montiel	Powerlink
Levi Rosenbaum	AEMO	Dean Knight	Powerlink QLD
Magnus Hindsberger	AEMO	Jennifer Brownie	QEUN
Marr Marston	AEMO	Ismael Perez-Smith	QLD DEPW
Natasha Sinclair	AEMO	Mat Yeo	QLD DEPW
Nick Culpitt	AEMO	Liz Billing	QLD DNRME
Nicola Falcon	AEMO	Bret Harper	RepuTex
Oliver Derum	AEMO	Ali Moradiani	RMIT University

Shayne D'Lima	AEMO	Andrew Manson	SA DEM
Vivian Mai	AEMO	Marino Bolzon	SA DEM
Ashok Kaniyal	AER	Elisia Reed	SA Power Networks
Craig Oakeshott	AER	Ron Logan	Shell Energy Australia
Tom Ralston	AER	Noel Sligar	Sligar and associates
Karan Sharma	APPEA	Jean Dussaubat	Solar Victoria
Ed White	Ausgrid	Steve Meiklejohn	Stanwell
Marc Thiebaut	Ausgrid	Mengyu Li	Sydney Uni
Morteza Moallemi	AusNet Services	Sharon Raymond	TAS Growth
Nick Cimdins	AusNet Services	Herath Samarakoon	TasNetworks
Saliw Cleto	AusNet Services	Julie Morrison	TasNetworks
Owen Pascoe	CEFC	Prateek Beri	TasNetworks
Thakshila Gunaratna	Clean Energy Council	Felix Keck	The University of Sydney
Sam Ingram	CleanCo	Manfred Lenzen	The University of Sydney
Luke Reedman	CSIRO	Trevor Lim	Total Eren
Mei Chew	CSIRO	Sujeewa Vithana	United Energy
Paul Graham	CSIRO	Bonnie McBain	University of Newcastle
Jay Gordon	CWA	Catherine Laurie	VIC DELWP
Wei Sue	CWA	Morris Dalton	VIC DELWP
Geoffrey Brett	DISER	Gavin Dufty	Vinnies
Justin Plant	DISER	Yun Li	Western Power
Alex Driscoll	Edge2020	Sara Hafeez	World Fuel Services
Abu Abdullah	ElectraNet		

1. Welcome and Introductions

Daniel Collins (AEMO) welcomed everyone and covered the following:

- FRG Consultations:
 - Energy Efficiency (EE) report published [online](#).
 - BMM energy intensity submissions closed on June 25.
 - Forced Outage Rates submissions close 14 July 2021.
- July Generation Information release will include new commitment criteria.
- Open actions
- Submissions to Energy.forecasting@aemo.com.au are appreciated.

2. Presentation 1 – 2021 Forced Outage Rates (FOR) forecasts

Ben Jones (AEMO) presented AEMO's 2021 Forced Outage Rates (FOR) forecasts for coal, gas and other generators. Ben also presented transmission line forced outage rates.

Key topics raised by stakeholders during this session included:

- Abu Abdullah (ElectraNet): What is the probability benchmark for high impact low probability (HILP) events?
 - AEMO: These probabilities are driven by the observed rate of HILP events in the 11 years of history used.
- Abu Abdullah (ElectraNet): Do future FOR incorporate plant behaviour changes?
 - AEMO: Yes, future operational characteristics are provided by participants.
- David Headberry (MEU): What drives the FOR increase from 2020 forecasts?

- AEMO: The 2020 FOR forecasts used AEP Elical's projections, which predicted deterioration in the years before closing. 2021 FOR are almost all based on participant responses, which predicts increasing FOR.
- Ron Logan (Shell Energy AUS): Has AEMO compared actual regional coal outages on critical summer 20/21 days with 2020 ESOO modelling?
 - AEMO: Yes, the 2 charts on slide 6 show the comparison. This will be investigated in the 2021 Forecast Accuracy Report.
- Ashok Kaniyal (AER) and Ben Skinner (AEC): Why are transmission line outages only applied to reliability assessment while thermal power plants HILP outages are modelled for the ISP too?
 - AEMO: The objectives of each approach vary: The ISP is for capacity building and system development while the reliability forecast calculates system reliability. AEMO will review the implementation of HILP and transmission FORs in the ISP. **(Action 5.6.1)**
- Ben Skinner (AEC): What was the biggest transmission FOR cause?
 - AEMO: Reclassification events. The average single contingency event outage duration is 21 hours given the events considered; bushfire outages can be 7 days while lightening outages can be only 1 hour.
- Ron Logan (Shell Energy AUS): Directly relating FOR to extreme summer weather conditions will assume an outage on the hottest days every summer?
 - AEMO: FOR are aligned with the Forest Fire Danger Index (FFDI) to relate to the inherent fire risk, rather than just temperature. In practice this has substantial diversity between reference years and does not perfectly correlate to peak demand periods.
- Ron Logan (Shell Energy AUS): Have new forest fire precautions been incorporated?
 - AEMO: Bush fire responsive line outage rates have been implemented for the two identified lines that are predominantly impacted by bushfire reclassifications. Given that the immediate proximity of a bushfire is not required to trigger a bushfire reclassification, and the magnitude of the vegetated area surrounding these lines, these are not expected to have a material impact.
- Ron Logan (Shell Energy AUS): FOR should be presented again with more details.

3. Presentation 2 – Multi-sector Modelling (CSIRO & CWA) AND

Presentation 3 – Incorporation of Multi-sector Modelling (AEMO)

Luke Reedman (CSIRO) presented CSIRO and Climate Works Australia (CWA)'s Multi-sector modelling outcomes across sectors and scenarios and its insights and implications. Debborah Marsh (AEMO) presented AEMO's planned incorporation of the Multi-sector Modelling into consumption forecasts.

Key topics raised by stakeholders during this session included:

- Lawrence Irlam (Energy Australia): What drives strong industry electrification in the Strong Electrification scenario? Should Energy Efficiency (EE) improve?
 - Jay Gordon (CWA): The scenario explores generic electrification technology uptake with drivers to unlock high electrification potential of all industries.
 - AEMO: This sensitivity is to specifically model high electrification without large improvements of other technology, including hydrogen and EE.
- Richard Owens (ISP Consumer Panel): Increases in electrification forecasts seem to mainly occur after 2030. Will these determine actionable ISP 2022 projects or will they only be included when better information is available?
 - AEMO: Actionable ISP projects have shorter term needs, where a two year delay in investment will forego benefits. Therefore, if electrification is the primary need for an ISP project, it would unlikely be actionable. All project assessments will consider longer-term benefits, including electrification. However, the modelling is yet to be conducted to provide a definitive response and the ISP model will always include the latest information.
- Richard Owens (ISP Consumer Panel): Did CSIRO model slower growth scenarios?
 - AEMO: CSIRO only modelled scenarios and sensitivities with explicit decarbonisation ambitions. Presentation 3 slide 6 shows AEMO's

electrification forecasts for all scenarios. Steady Progress and Slow Growth have very little electrification with minimal structural change.

- Patrick Gan (EnergyAustralia) and Mark Grenning (ISP Consumer Panel): Why is electrification in Net Zero mostly towards the back end of the 2040's?
 - CSIRO: Discount rates in the model promote delayed electrification investment in Net Zero, causing sharp decarbonisation after 2040. Slide 14 shows decarbonisation trajectories.
 - AEMO: Net Zero assumes that technology, rather than a carbon budget, drives decarbonisation. Current technology infancy means that the short term focus on Research and Development allows significant action closer to 2050.
- John Cheong-Holdaway (Jemena): Does the model include ~30PJ biomethane projects, which will expand with hydrogen?
 - AEMO: The “bioenergy” category includes many energy sources. While the current levels include substantial wood fuel, there is a growth of bioenergy consumption in all scenarios that would be larger than 30 PJ.
- John Cheong-Holdaway (Jemena): Can the costs of each decarbonisation scenario be compared and distributed?
 - AEMO: Each scenario operates within different constraints, consequently the scenarios costs are not directly comparable. The intent of this modelling is to explore the potential impact on the electricity sector, not to calculate the most cost-efficient decarbonisation path for Australia. The scenarios themselves assume different drivers and are not intended for direct comparison in this way, given the number of differences.
- Ashok Kaniyal (AER): How does the electricity sector's abatement burden shift across the different scenarios?
 - AEMO: The outcomes from Presentation 2, Slide 7 are being used to create a total emissions budget for the NEM that would be consistent with other changes in the broader economy to achieve the emissions reduction targets. Each scenario had notably different emissions budgets for the NEM.
- Ashok Kaniyal (AER): Does the model consider the cost of technology uptake?
 - AEMO: Generation costs are consulted on via GenCost¹. Consumption side technologies, including EE, are based on scenario narratives.
 - CSIRO: The report will detail technology cost assumptions in each scenario and the balance between falling technology costs and rising implicit carbon costs.
- Dennis Van Puyvelde (ENA): What electrification opportunity is there in agriculture?
 - CSIRO: Agriculture electrification is from DER uptake, mainly replacing diesel.
- Dennis Van Puyvelde (ENA): Has the impact of electrification on winter peak demand been considered for intraday profiles and seasonal peak capacity?
 - AEMO: This is included in AEMO's maximum and minimum demand forecasts.
- Manfred Lenzen (University of Sydney): Do the forecasts consider safeguards against technology failure and feasibility risks, including an EE rebound effect, the availability of precious metals required for renewable generation and the scalability of carbon removal strategies?
 - CSIRO: EE rebound effects and precious metals availability were not considered. It is acknowledged that rebound effect may increase demand and the lack of availability of critical materials may change the technology mix, but this was not able to be covered in this work. The carbon removal strategies included both land use and technology. Most of the sequestration was actioned through land use and there was further scope that this could be expanded if required (and cost-effective).
- Gavin Duffy (Vinnies): Will the federal government's Inter-Generational Report (IGR) be included in future forecasts?
 - AEMO will look into the IGR.
- David Headberry (MEU): Has the modelling considered the costs of gas asset owners stranding their assets as natural gas usage declines? Large gas users will actively seek to retain their assets as used and useful; manufacturing needs thermal gas which

¹ GenCost is a collaboration between CSIRO and AEMO to deliver an annual process of updating electricity generation and storage costs with a strong emphasis on stakeholder engagement. 2021 report available at: https://www.csiro.au/-/media/EF/Files/GenCost2020-21_FinalReport.pdf

cannot be substituted with electricity. Do the forecasts recognise that the conversion of gas to electricity in Victoria would result in tripling the size of the electricity network? Additionally, the changeover has to be done at once, users will not adjust to a gradual transition. On the upper end, full electrification is not possible and on the lower end, even Step Change seems to have a gradual changeover.

- CSIRO: End use is in line with IEA scenarios. The scenarios do include residual, non-electrifiable gas use. Presentation 2 slide 9 shows the different roles of gas in each scenario. The cost of increased generation to satisfy increased electricity use is included.
- Jennifer Brownie (QEUN): We should also be considering the impact on the gas pipeline network for both Strong Electrification and Hydrogen Superpower.
- Patrick Gan (EnergyAustralia): Are there any preliminary results on how electrification will impact intraday and seasonal load shapes.
 - AEMO: This energy use is translated into daily data based on the reference year and then converted into 1/2 hourly data using the profile of the daily demand. The next stage of the ISP is to use this data to determine the optimal generation, transmission and demand assets to meet 1/2 hourly consumption. This will be further described in the soon to be published IASR and ESOO.
- Lawrence Irlam (Energy Australia): Has forestry sequestration been sense-tested?
 - CSIRO: Carbon forestry trajectories are based on prior models and has been sense checked and is translated into land area terms.
- Manfred Lenzen (University of Sydney): Was the correlation between affluence and wellbeing at high income levels checked in scenarios?
 - CSIRO did not specifically model this.

Nicola Falcon (AEMO) asked the FRG if the spread of scenarios, are capturing enough spread of possible futures on both ends of the spectrum?

- Richard Owens (ISP Consumer Panel): Strong electrification is a good high bookend.
- Craig Oakeshott (AER): The high-end scenarios seem to capture sufficient growth and the IGR, with debt to 2060, validates the slow side. Perhaps the hydrogen superpower scenario is overly optimistic for the current global scenario. Although previously, it might have been considered that the Slow Growth scenario was overly pessimistic.
- David Headberry (MEU): The high electrification bookend has no commercial reality.
- Ashok Kaniyal (AER): Can a "practicality test" be used to assess the feasibility of delivering the pace of investment needed to drive some decarbonisation outcomes (e.g. the last ten years of the NetZero)?

4. Other business

Key topics raised by stakeholders during this session included:

- Ron Logan (Shell Energy AUS): The maximum and minimum demand presentation should detail all assumptions.
- Ron Logan (Shell Energy AUS): Please distribute answers to all remaining Slido questions. **(Action 5.6.2)**

5. Meeting close

The next FRG meeting will be held on Wednesday 14 July 2021 with a presentation on 2021 maximum and minimum demand forecasts.

Appendix A Forecasting Reference Group (FRG) Actions Items

FRG Action Items – **OPEN** (as at 30 July 2021)

Item	Date Raised	Topic	Action required	Responsible	Due	Status
5.5.1	26/5/21	Additional graphs	AEMO to provide a graph on distributed PV generation as a measure of the proportion of potential rooftop PV being realised	AEMO	July 21	In Progress
5.6.1	30/6/21	Transmission outages in the ISP	AEMO will clarify which outages are included/excluded in ISP and reliability forecasting modelling	AEMO	Aug 21	In Progress

FRG Action Items – **CLOSED** (as at 30 July 2021)

Item	Date Raised	Topic	Action required	Responsible	Details	Status
5.6.2	30/6/21	Distributing Slido answers	AEMO to respond to unanswered slido questions	AEMO	Stakeholders can email questions following the meeting to energy.forecasting@aemo.com.au	CLOSED