MINUTES

MEETING: CROWG – Control Room Operations Working Group

DATE: Tuesday, 18 April 2023

TIME: 9.30am – 12.30pm

LOCATION: Remote via Microsoft Teams

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ATTENDEES:

NAME	INITIALS	ORGANISATION
Mario Rositano	MR	AEMO (Chair)
Alexis Bowman	AB	AEMO
Ali Masoum	AM	AEMO
Caroline Ferres	CF	AEMO
Daniel Lavis	DL	AEMO
Darren Spoor	*DS*	AEMO
Neil Ginbey	NG	AEMO
Gary Paterson	GP	AGL
Matthew Ansell-Laurendet	ML	Ausgrid
Phil Gay	PG	AusNet
Paul Bensil	PB	Baywa-re
Adrian Pang	CP	CWP Renewables
Anthony Stanczak	AST	Delta Electricity
Simon Bolt	SB	Delta Electricity
Duane Brooks	DB	Electranet
Rod Joyce	RJ	Endeavour Energy
David Molla	DM	Energy Australia
Gayle McAllister	GA	Energy Australia
Vijay Kumar	VK	Energy Australia
Russell Gordon	RG	Energy Queensland
Ryan Pike	RP	Energy Queensland
Warren Wood	WW	EVOenergy
Philip Vegh	PV	Goldwind Australia

NAME	INITIALS	ORGANISATION
Tony Saker	TS	Goldwind Australia
Paul Vickers	PV	HARD Software
James Sherrin	JS	Hydro Tasmania
Jordan Maxwell	JM	Iberdrola
Chris Van der Zalm	CZ	Loy Yang B
Hal Jorgensen	HJ	Neoen
Mike Griffiths	MGS	Origin Energy
Ellise Janetzki	EJ	Overwatch Energy
James Tetlow	JT	Overwatch Energy
Jonathon Dyson	JD	Overwatch Energy
Duncan Griffin	DG	Power & Water Corporation
Vernon Lee	VL	Power & Water Corporation
Leanne Maurice	LM	Powerlink
Sam Gard	SG	RES Group
Aren Sears	AS	SA Power Networks
Ron Logan	RL	Shell Energy
Michael Paine	MP	Snowy Hydro
Michael Dugdell	MD	Stanwell
Colin Sharp	CS	TasNetworks
Fabian Spescha	FS	Total Eren
Geoff Cook	GC	TransGrid
Warwick Slee	WS	TransGrid
Warren Mumme	WM	Western Power

GUESTS:

NAME	INITIALS	ORGANISATION
Michael Gatt	MG	AEMO
Gary Tuckwell	GT	AEMO
Tjaart Van der Walt	TW	AEMO

APOLOGIES:

NAME	ORGANISATION
Bill Clark	Stanwell
Derick Boonzaaier	Stanwell
Harley McKenzie	HARD Software
Nicholas Engerer	Solcast
Rajesh Arora	AECOM
Steve Frimston	GDF SUEZ Australian Energy
Tony List	Territory Generation
Vedran Kovac	Hydro Tasmania

1 Welcome and Introduction | Mario Rositano

1.1 Roll Call taken via MS Teams.

1.2 Welcomed members, reviewed the agenda and discussed purpose of the meeting, including continued discussions on topics tabled at the last meeting.

1.3 Introduced presenters and advised that the presentation items 5.4 and 5.5 for the WA Power System and SCADA will be postponed to the next meeting.

2 Minutes / Actions | Mario Rositano

2.1 Minutes of the CROWG meeting 08 November 2022 – seconded by Phil Gay of AusNet

08 November 2022 - CROWG Minutes

2.2 Actions reviewed | 08 November 2022 – CROWG Actions Register

3 CROWG Meeting Administration | Mario Rositano

3.1 Rotating CROWG "Chairing" role:

- Call for volunteers for July 2023 meeting. *MR* will reach out to members again via email.

3.2 CROWG page created on the AEMO Website – Forums and Working Groups

- A page for the CROWG has been created in the AEMO website, in the Forums and Working Groups section > List of Industry Forums and Working Groups.
- The CROWG ToR, Reference Papers and Records from meetings will be published to this page, along with any other relevant documents will also be uploaded to this section in the future e.g. restart terminology.

3.3 CROWG mailbox

- New email account has been created CROWG@aemo.com.au.

3.4 Next CROWG Meeting – Face to Face?

- Members were asked for their interest in attending a future CROWG meeting face to face. The July CROWG meeting will be held remotely, with a vision to schedule the November meeting face to face.

3.5 NSW System Restart Training Invitation

- *DL* – advised that the AEMO is delivering NSW System Restart Training in October-November 2023. Six sessions scheduled | October 12 & 19 | November 02, 09, 23, 30. Please register your interest via email to RTOTraining@aemo.com.au to be included in the invitation and information list.

ACTION: MR – Send email to CROWG Members seeking assistance with Chairing duties for July 2023 meeting – reminding members that everyone is eligible for the role.

ACTION: ALL MEMBERS – For NSW System Restart Training October-November 2023. To be included on the invitation and information email list, please register your interest via email to RTOTraining@aemo.com.au

4 Power System Events since Last Meeting | All Participants

4.1 Update from members

- Carried over to the November meeting.

5 Presentations, Addresses and Suggested viewing material

5.1 Q & A | Michael Gatt, AEMO Executive General Manager – Operations.

- *MG* presented content on the following topics:
  - Strategic Objectives – Operating Today's systems and markets
    - Deliver our core responsibilities in accordance with electricity, gas and other laws and regulations.
  - Significant Power System Events and Operational Challenges
    - Key reviewable incidents – March 2021 to present
    - For a full list of reviewable events, visit the AEMO website:
      NEM Events and Reports page – Power System Operating Incident Reports
  - Summary of ESB Post-2025 Market Design Recommendations
    - Immediate / initial / longer-term recommendations for resource adequacy mechanisms, essential system services & ahead mechanism, transmission & access reform, integration of DER & flexible demand and data strategy.
  - How the Operational Need is Changing – Engineering Framework Operational Conditions
    - The six identified future operational conditions discussed are from the AEMO website > Initiatives > Major Programs section – Engineering Framework page - AEMO Engineering Framework - Initial Roadmap
  - Control Room of the Future – Vision Statement and Purpose
  - Operations Technology Program (OPWG) Overview
    - Control Room of the Future (CROF) – Secure, reliable, resilient, safe and flexible operations, which facilitate a goal of 100% renewable operations – Manual Settings & Procedures / Algorithms.
    - Real Time Operations Management Platform – Conceptual Design
  - Operations Technology Program – Capability Transformation Objective
  - Operations Technology Program - FY23/24 Major Projects
    - RTO Management Platform
    - Forecasting Platform
    - ST-PASA Replacement
    - PMU Monitoring Platform
    - Power System Monitoring Modelling Uplift
    - Operational Data Management Platform

5.1.1 Member Questions and Discussion

- *CZ* –10% renewable target is a concern at Loy Yang B and he asked if instantaneous renewables exclude batteries?
  - *MG* - Not excluding batteries because they are seen as an essential part of frequency control. if you look at SA at different times, minimum demand in in SA dropped down to about 114 megawatts. Extremely low and in SA where we could just about meet the entire demand for SA with instantaneous renewables at that point in time. There is still a minimum 2 synchronous machine requirement in SA and as we are starting to hit the limits of grid reference and frequency control, we can see that at some point in time, it may well shift towards not necessarily having a synchronous generator, but synchronous condensers and system strength and support in the power system. Batteries are going to play a critical role in the future energy system.
- *CZ* – What about some synchronous machines like Hydros potentially thermal machines fuelled by a renewable source? Are they considered in the 100% renewables plan?

- *MG* – Yes and particularly the hydros, are looked at as any other synchronous machine. AEMO did a study about what would be required for 100% instantaneous renewables and it came up with several 40 or 40 plus synchronous condensers or machines operating in synchronous mode at different periods of time. That is an extremely different power system to the one we operate today. It is good work and important work for us to do, but there is a long road to get there. The only uncertain thing is how fast that will happen.

- *TW* – Regarding the Control Room of the future and automating, I think it is not going to be switch on the computer and walk out of the control room. The aim is around making our lives a bit easier in the control room. The example is intelligent alarm management type of situation. It is not going to be autopilot and walk out.

- *MG* –Automation is the right thing to guide us and guide our investment and guide our strategy. It would be foolish to suggest, as Tjaart mentioned, that we will walk out of the room and it is all on autopilot. That is very ambitious.
- *MG* – responded to a chat comment from GA, agreeing that Tasmania has more synchronous renewables and probably not a fair comparison, but at the same time might represent what future energy systems can operate at, particularly with 100% renewables, but not a fair fight, he agreed.

- *TS* – Regarding operational insights and some of the failures that have occurred. What degrees are these root causes at play, where do you see SCADA fitting in that level of importance?

- *MG* – AEMO recently undertook analysis for our board and found that SCADA should be considered separately to communications networks failures. The reason is there seems to be a series of communication system failures and exposure and risk that we can afford to get a better handle on. For some time, we have experienced those shortcomings. When you break them down, you'll always find that there were people working on software that had an unintended consequence. It may be an operator error, but with some of the exposure of the communications systems and networks, there is an expectation that the future energy system will have a degree of resilience.
- Regarding the lessons learned from the incident and investigation reports, they have always got recommendations and actions that we see through and execute within our teams and people and with the businesses involved.

- *WW* – Regarding demand response. Is that something you see potentially being available at a micro level? E.g. the ACT network is looking at decommissioning of the gas network, about a 30% increase in load across the system. Meaning we need to reconnect every bit of low voltage and everyone's backyard as it is built in the ACT. It would be convenient to have the option to manage demand rather than build a network to cater for those exceptional high demand periods. Do you see a point where we have more control of people's appliances and load in the household, at a street level and then can we use that to manage things like voltage fluctuations?

- *MG* – There is a facility for wholesale demand response in the marketplace for big players to participate at that level. It has not been a roaring success because many participants have elected to participate in RERT, so in the emergency schemes as opposed to the transactional schemes. Future tariff structures and retail development will be the thing that will drive participation in demand.
- In short, I do see a structure that allows for it, but it is probably more retail and tariff LED than network specific. The network will provide a driver but must connect it with the customer better than what we are able to today.

5.2 Q&A | Tjaart Van der Walt – AEMO Group Manager NEM Real Time Operations

5.3 Operations Technology Program | Garry Tuckwell – AEMO Program Director Operations

- *GT* presented content on the following topics:

- Required Capabilities - In the last few months AEMO has been unpacking the capabilities needed to manage the system and the market for 100% renewables and the Control Room of the Future. It is taking time to unpack to get clear as a leadership team and when we talk about capability, we talk about the process, the systems, the data, the KPIs and getting very clear in our own minds, as there are many people involved across the breadth of AEMO.
- Frequency - Who does deal with frequency? Many hands go up when that question is asked. Who is responsible to find how we manage frequency and operations? We can get quite specific as to the person and that was important because as we think about this future, we do have to reimagine what each of these capabilities would look like,

particularly around the processes. How might we manage constraints in 100% renewable and what does that mean for the underlying systems and technology? And as Michael shared, a lot of that.

- Current systems and technology are becoming very dated - need to be refitted. Ideally, we do not want to just build the same mouse trap in, we want to improve on that and build a better mouse trap for the world going forward.
- Automation - We envisage a world where there is going to be more algorithms and more automation. We do not foresee a future where we have as much time available to make decisions and respond to events that are happening.
- Human Involvement - There will always be a human in the loop, focusing on those higher order tasks and managing the exceptions with the system being able to deal with a lot of the day-to-day tasks with a high degree of confidence. Only when there is an exception do we need to intervene and apply logic. This is directionally where we are heading.
- Visualisation of the UI – Gaining clarity on the visualisation of the look of the user interface. Having a look at workflow and process orchestration capability automate some of those manual tasks that Michael referred to earlier.
- API Library - Making sure we have got a good API library to call on this on the systems that sit in the background that are required in the control room and then starting to automate some of the capabilities *(API – mechanisms that enable two software components to communicate with each other using a set of definitions and protocols. API Library – a centralised catalogue of API collections that are discoverable and can be utilised by other users in your organisation)*.
- AEMO Market Notices App - AEMO is currently working on market notices, enabling that capability when we issue notices out to the market. The process is completely manual today. We are looking at how to automate that and free up time so that our teams can work on higher order activities.
- Constraints - Constraints is the next one. There are two pieces to that
    - How do we update and maintain our constraint library with more participants joining the market?
    - How does the control room interact with that? How do they invoke them? How do they revoke them? We are going to create a space for our teams to reimagine what that would look like in a renewable world and let that inform what a target state process and system might look like and then put that into the program.
- Forecasting – Significant investment is also being put into Forecasting. We are looking at weather services, multiple inputs - how we might fuse them together and increase the reliability and accuracy of our forecast.
- Resource adequacy - In terms of managing energy system reserve levels. The system we have got has served as well for a long time, however we are living in a more complex environment. The algorithms need updating. A lot of work will be done in that space over the coming years.
- PMUs – A lot of PMUs are being rolled out in the transmission space, which is great. AEMO has a program working with participants to put that together. We are upgrading the systems to capture that data and to feed that into EMS so we can look at the small signals as stability coming in and driving that.
- Modelling – AEMO is starting to look at modelling. *MG* discussed simulation being part of the answer. With the additional data that we have got coming in, we are looking at how to update those models and use them in a real time capacity to help us solve problems that the rooms face day today.
- Increased Data Inputs - We are living in a world with more devices, much smaller time samples and a plethora of data inputs. We need to make sure we have the appropriate structures in place for our enterprise data for long term trend analysis and querying, but also real time.
- Communications and Engagement Plan - How do we collect the data that is coming in from the various systems and how do we serve that up in any real time capacity? We have put together a communications and engagement plan. It includes presenting at forums like the CROWG starting to lift the veil to share with stakeholders what is going on within the program on a regular basis, as guided by *MR* and the working group members.
- Outage Management – An example is when outage management starts to impact processes, that will result in change for all of us. Then we will further engage through a working group in any one of these projects.

5.3.1 Member Questions and Discussion

- *MR* – Regarding information visualisation for Control Room Operators – is there a potential for a connection between EMS and MMS, which would really unlock a lot of potential, however this initiative was not actively pursued. Is there current 'buy-in' on that topic?

- *GT* – A connection between EMS and MMS is not currently envisaged.
  - We are potentially going to see events happening in the energy system that will require us to issue directions, market notices and some of the tasks we want to eliminate the swivel chair and the cutting and pasting.
  - That is absolutely within the realms of possibility and there is a high probability that will happen.
  - There is a need to lay the foundations for this work. Included in this is the current work with Market Notice Templates and automation for populating text blocks., automation for triggers and issuing Market Notices.

- *MR* – Expanding on that, in an ideal world, controllers would like the capability to look at the EMS screen, where a line has come out, hover over that line and view what constraints are invoked and narrow it down to enable constraints to be invoked directly from the EMS screen.

- *GT* – AEMO are starting to focus on constraint management and comprehending challenges in the control room in dealing with it.
  - Automation has been implemented based on catalyst criteria for invoking constraints. One example is lightning reclassification – where we can automatically invoke a constraint.
  - There are other things that occur where we do not automatically invoke constraints and the team have to go through the long process of searching the library, finding the right constraint, then invoking it - when things have reverted back to normal conditions, revoke the constraint again and potentially controllers can get caught up where we have got some planned outages and we have got certain system configuration set ups and then something unplanned happens. Having to deal with that kind of additional complexity in the finite amount of time the teams must respond, that is a real challenge.
  - That is why we want to create a space, preferably offsite, where the team can go to brainstorm to reimagine what that might look like, devise a solution and arrange to put the investment in place to help deal with that.

- *JS* – what skills and experience do you think the human in the loop needs to be in the next few years? Major changes compared to now.

- *GT* – It is going to be a blend power systems knowledge and IT knowledge.
  - A higher number of the grads coming through, have the dual skills and capability.
  - It is expected that in the future there is going to be more supervisory engaging with a process orchestration engine, splash of business rules engine where, rather than having to go to IT to get changes made, people will be able to say, if you see this then go and do that.
  - Having the logic to deal with that kind of interface will be exceptionally beneficial. It will be managing by exception. The more we automate systems and processes based on the knowledge and skills of the people in the room and then configuring those systems with the ability to deal with things that have not gone to plan.
  - It is that combo power systems IT – including data science and data analytics,
- *DS* – Agreed and expanded to include the human factors element that will be coming through very strongly, as well as communications and decision making. The ability to maintain situational awareness and make the decisions that are needed within the appropriate time.
- *DS* – Continued investment being made in uplifting the operational tools and in replicating the new tools into the NEM simulator was also raised.
  - *GT* - It is the digital twin of the NEM Control Room. Whatever uplift is happening in the NEM Control Room will in the training simulator as well. A key objective has always been to keep those in sync, so we can continue to train our people in dealing with what is out there in real time.

- *SB* – in response to 25th of August event where we recognised that some speed of reaction to the separation between regions was necessary in response to some frequency reactions, some of the information you were talking about Garry, suggests some automation is being developed or may have already been developed in reaction to that specific issue.

- *SB* - The second recommendation says – reconfiguring AEMO systems, including AGC and NEMDE after separation and large system events - automating secondary frequency control implementation after separation events. I emailed to investigate the opportunity for automation of reconfiguring AEMO systems, including AGC and MD after separation and large system events.

- The general point is that there is a lesson from history, rather than a system to deal with a possible future event. This is an event from history, which significant attention should be given.
  - *GT* – We will take that on notice. Offline Garry will ask the relevant teams and will then provide comment.
- *MR* – Expanded on the discussion - there is a manual process AEMO carry out with regards to AGC and setting up the AGC. Depending on where that split is, it can be a bit more complicated. If we can get that automated and get that done quickly following a separation, that would be an advantage. The event on 25 August 2022 and subsequent report will be added to the agenda for the July CROWG meeting.
- *TW* – Agreed that SB was referring to the Control Room of the Future and required automation – Agreed that we need to find a way of operating, as it is already here, now, not in the future.
- *SB* – Question regarding how FCAS is dispatched. If it is dispatched in one region and not in others, that needs to rapidly change as soon as there is a separation – how is that accomplished?

ACTION: MR – Locate and review the report for the 25 August separation event and add a discussion topic to the next CROWG meeting in July.

5.4 SCADA Presentation

- Carried over to the July CROWG meeting.

6 Phone pre-recorded messaging | Mario Rositano

6.1 Discussion on disabling the telephone pre-recorded messaging and beeping when calling control room to control room – Feedback from TasNetworks

AEMO Process Guide | Voice Recording – NEM RTO | Guidelines for Voice Recording & Retrieval

- *CS* – TasNetworks investigated the issue, with follow up from Tjaart and pre-recorded messaging is stipulated in National Electricity Rules – Clause 4.11.4 Records of power system operational communication – Section C which states "*when a telephone conversation is being recorded under this clause, the persons having the conversation receive an audible indication that the conversation is being recorded*".
- *MR* – Advised that while there may be some memorandums of understanding between certain participants with regards to pre-recorded messaging, as a rule, pre-recorded messages advising parties on the call that they will be recorded, must remain. The best idea is to find a script that keeps the pre-recorded message as short as possible. There may be a solution or options with the new BT Phone systems being implemented in the NEM control rooms, however that is a work in progress. MR will update the group as information is made available.

ACTION: ALL MEMBERS – If members know of a policy or procedure for call recordings within their organisation, if they have permission, forward a copy to Colin Sharp.

7 Familiarity with Manual Frequency Control | Darren Spoor

7.1 Discussion regarding units being able to provide this service

- The PSSWG is looking at managing system security following a potential loss of voice comms or SCADA telemetry.
- Arising from these conversations, AEMO is looking at residual power system security obligations for TNSPs and how they might be able to assist in managing system security if communications is lost, or telemetry is lost.
- As a result of those conversations, it was raised that there have been instances where questions have been raised by some generators about their ability to manage frequency control manually moving forward.
- Action taken from the recent PSSWG was to raise this issue with the CROWG to determine if there was any general feedback. Anything that we might be able to do to facilitate this capability moving forward, either in the form of training or potentially defining obligations.

7.1.1 Member Questions and Discussion

- *DS* – asked participants if they are requested to manage frequency manually, can you station do it and are your staff trained to do it? Also asked participants to advise of any systemic issues that AEMO may need to manage?

- *SB* – Will take the question on notice and report back at the next CROWG.
- *GA* - Reasonable to assume that we, whilst we *may* be able to do it (but cannot confirm that they can) that is not a front of mind as a possibility. It is not covered in the normal training procedure for Loy Yang B, however, demonstrates significant opportunity for process improvement
- *MGS* – Not something Origin has looked at before with a peaking plant.
- *DM* – This is not included in the Energy Australia Training Program for Operators. EA have a mechanical governor flyball governor with a 3% group. It is a function of speed, fundamentally. As the system slows, it will try and open. The mechanical governor will, if there is percentage there on our governor, try and give you everything right up to saturation of 100% open and fundamentally, that can be anywhere within the Energy Australia boiler range, of course.
- *JS* – Hydro Tasmania has a procedure for transferring frequency control from AEMO to Hydro Tas. However, the last time it was tried, test networks, there were mixed outcomes. It is included in Hydro Tas Operator training, not as predominantly as would be liked. However, with SRAS delivered to trainees for black starting units, they gain some exposure to manual control and have opportunities to manually control some units throughout their training. It is not something they do very often, though there are procedures for the process.
- *VL* – Brought Jack Green a Dispatch Controller with Power and Water Corporation, who trialled the process when they handed frequency control back to Territory Generation – Channel Island, the largest power station. Testing was straight forward. Control was handed back and forth easily and propose to carry out similar testing monthly to enable operators at the more exposure to and comfort with it. This is a new initiative, implemented within the past couple of months and is part of the Operator's formal training program.
- *DS* – Asked DL if this topic is something that should be included at the OTWG?
  - *DL* advised that topic will be included at the next OTWG and will report back to the CROWG and/or the PSSWG.

ACTION: DL – Include discussion topic on manual frequency control for generators for the next OTWG meeting and report findings to CROWG.

- *JM* – It is assumed that the discussion is primarily about thermal and hydro units. However, as we move into the new of the future, we will be moving away from that. This is a space that where it would be good to see batteries and renewables planning and investigate the capability of providing a similar response.
  - *DS* - The answer to that is yes. If a facility can provide a commensurate response, it would be considered in a similar way. Is that something that your fleet would be capable of achieving?
  - *JM* - Not currently. However, thinking around the battery capabilities and whether there could be something there that could be unlocked, but no nothing currently.
- *MP* – Snowy Hydro units are configured where to run each of governor in an islanded mode, to a speed set point.
  - Only concern with that is normally we can have only one unit in the speed control there is considerable effort from operators in moving the other generators to make sure that unit doing the speed control is staying in the middle of its range. The other option that we have from our training program is that Snowy Hydro have their own SCADA and AGC system. They can run constant frequency, drive in a frequency, set the point and have the entire fleet doing frequency control. We need to do some sort of testing at some point if we wanted to make sure that was going to work reliably. So yes, we do have the option.
  - Training for manual frequency control is something that is included in Snowy Hydro's Operator training programs. Operators have several opportunities to practice running the units as speed units.

- *DS* – To conclude, there are two key themes from this discussion. First, relevant CROWG members should identify the capability they do have, for discussion and collaboration at the next CROWG meeting. Second, if stations do have the capability, relevant CROWG members need to advise the following:
  - Do they have staff to carry out the manual frequency control process?
  - Do they have a current training program (formal or informal) that includes manual frequency control?
  - If manual frequency control is not a component of a current training program, identify whether there is a requirement for establishment of a specific training program for manual frequency control, or can it be added to an existing training framework?

ACTION: GENERATORS – devise responses for the questions listed above and report back at the next meeting:

8 Workplace Health, Safety and Environment in Power System Operations

8.1 Discussion on how WHSE applies to the Power System

- Carried over to the July CROWG meeting.

9 Training | Daniel Lavis

9.1 *DL* presented content on Cognitive Load in Control Room Scenarios, including:

PRESENTATION:
Cognitive Load in Control Room Scenarios

- Investigating cognitive load in energy network control rooms - Why was Monash University engaged by AEMO to undertake this study?
- Defining Cognitive Load – What high cognitive load can lead to and how cognitive load can be measured.
- Study Methodologies – AEMO Environment - Subjective Assessment and Biophysical factors.
- Study Process – 4 days recording – 8 sessions – approx. 60 minutes – 2 participants per session
- Eye tracking data – Inter screens visual trajectories
- Results and Recommendations of the study:
  - Optimise operator application arrangements
  - Linked view, associations and performance
  - Coordination of screens and documents
  - Optimise alarm prioritisation and improve association

- AEMO – MONASH Cognitive Loading Study – 2019
- MONASH Research Paper - 2022

9.1.1 Member Questions and Discussion

- *WW* – Did this study capture looking off screen as well, e.g. an Operator's phone, the radio, or around the room?
  - *DL* – Monash undertook three days of direct observation however, they only mapped the eye tracking across the main screens. It is a good point however, to consider other places operators often looked and potentially change the setup of these as well to assist with cognitive load.
- *MP* – Was the study carried out during the day shifts, or across night shifts as well?
  - *DL* – They studied the day shift mainly, however they did see the early overlap at around 4am and could study the fatigue element at that stage, however they did not observe a full night shift.
- *WW* – Regarding looking off screen, was a measurement taken of how much time was spent looking off screen? E.g. of the 12-hour shift, 9 hours were spent looking at the screen and the rest were anywhere else. Another point to note is the consideration of situational awareness in control room design.
  - *DL* – Monash undertook three days of direct observation however, they only mapped the eye tracking across the main screens. It is a good point however, to consider other places operators often looked and potentially change the setup of these as well to assist with cognitive load. Alarms, lights, automation.
  - Further discussion about location of screens, format of apps on screens and redesigning layouts to have less cognitive impact for the user. Other points raised included the impact of COVID and the need for multiple control rooms. It adds an extra layer, as when Operators are in the same control room, they can hear what is happening while managing an event, which is more difficult when in multiple control rooms.

9.2 *DL* updated members on the status of the Power System Operator Training Framework (PSOT):

- Framework developed early last year, published and we have been making progress with developing the initial 11 modules for the pilot program. Proposal in creation with Thomson Bridge to develop the modules is going to senior management to understand how we can, move forward with developing the framework. It is still in the RTO development stage and we should be able to provide you with examples and further information at the next CROWG.

10 Shift Work | Mario Rositano

10.1 Fatigue Management Discussion | Mario Rositano

- Ongoing and carried over to the July CROWG meeting.

11 Communications | Darren Spoor

11.1 Security in communications update

- Ongoing and carried over to the July CROWG meeting.

12 Electricity Industry Terminology and Phraseology

12.1 System Restart Document Update

- Final version created and been used as part of System Restart Training. Available for members on the CROWG page in the AEMO website.

12.2 Time Critical and Emergency Document Update

- Members will be asked to read and review the document as it needs amendments and additions. Comments are welcome. A meeting of the subgroup will be scheduled to finalise the document and it is envisioned that process will be concluded prior to the July CROWG meeting.

13 Control Room Technology and Ergonomics | Mario Rositano

13.1 What are the latest upgrades, ideas, proposals, projects, etc.

- Ongoing and carried over to the July CROWG meeting.

14 COVID-19 & Flu Season

14.1 Update from members – Control Set-ups, issues, etc.

- Ongoing and carried over to the July CROWG meeting.

15 Other Business

15.1 Feedback Survey

15.2 VDS Update

- Ongoing and carried over to the November CROWG meeting.

16 Next Meeting

- The next meeting will be scheduled for Thursday 27 July 2023. MR will send out meeting invitations.

17 Meeting Close

17.1 Meeting closed at 12.28pm (Market Time).

Meeting Forward Plan

DATE	HOST	LOCATION
Thursday, 27 July 2023	TBA	TBA
Tuesday, 21 November 2023	TBA	TBA