WEM PROCEDURE: COMMUNICATIONS AND CONTROL SYSTEMS

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VERSION RELEASE HISTORY

Version	Effective Date	Summary of Changes
1.0	01 September 2006	Power System Operation Procedure (Market Procedure) for Communications and Control Systems
2.0	Balancing Market Commencement Day	Replacement of Procedure resulting from Procedure Change Proposal PPCL0021
3.0	01 July 2019	Update to Procedure resulting from Procedure Change Proposal AEPC_2018_03
4.0	01 October 2021	Amendments to align Procedure with updates to requirements under the WEM Rules.

IMPORTANT NOTICE - EXPLANATORY NOTES

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1. INTRODUCTION

1.1. Purpose and scope

1.1.1. This WEM Procedure: Communications and Control Systems (Procedure) is made in accordance with AEMO's functions under clause 2.1A.2(h) of the Wholesale Electricity Market Rules (WEM Rules).

1.1.2. The Electricity Industry Act 2004, the WEM Regulations and the WEM Rules prevail over this Procedure to the extent of any inconsistency.

1.1.3. In this Procedure, where obligations are conferred on a Rule Participant, that Rule Participant must comply with the relevant obligations in accordance with clause 2.9.7A or 2.9.8 of the WEM Rules, as applicable.

1.1.4. The purpose of this Procedure is to describe:

(a) The communication and control system requirements necessary to;

(i) Support the dispatch process [Clause 2.35.4] and

(ii) Enable AEMO to remotely monitor the performance of the SWIS [Clause 2.36A.5]

(b) The high-resolution time synchronised data requirements necessary to enable AEMO to [Clause 2.36A.5];

(i) Accredit a Facility's Frequency Co-optimised Essential System Services capability

(ii) Monitor a Facility's Frequency Co-optimised Essential System Services response

(iii) Monitor a Facility's compliance with its Registered Generator Performance Standards

(iv) Investigate incidents on the SWIS that impact Power System Security or Power System Reliability or market operation and

(v) Any other matter for which high-resolution time stamped data, where available, may assist with monitoring the performance of the SWIS

(c) The minimum standards and specifications of the communication and measuring information;

(d) The manner in which communications data and measuring information is to be provided to AEMO; and

(e) Any other relevant matters required for AEMO to perform its obligations in respect of section 2.36A of the WEM Rules.

1.1.5. Appendix A of this Procedure outlines the head of power clauses that this Procedure is made under, as well as other obligations in the WEM Rules covered by this Procedure.

1.2. Definitions

1.2.1. Terms defined in the Electricity Industry Act 2004, the WEM Regulations and the WEM Rules have the same meanings in this Procedure unless the context requires otherwise.

1.2.2. The following definitions apply in this Procedure unless the context requires otherwise.

Table 1 Definitions

Term	Meaning
Analogue Value	Digital representation of a continuous value (for example, a power flow)
Automatic Generation Control System (AGC)	Has the meaning given in the Wholesale Electricity Market Amendment (Tranches 2 and 3 Amendments) Rules 2020.
Control Command	A representation of an instruction to perform a defined action (for example a generation increase)

Critical Outage	For a Remote Monitoring Equipment (RME) or Remote Control Equipment (RCE): A loss for more than 60 seconds of the ability to transmit Operational Data to AEMO or receive Control Commands from AEMO, but not where the loss arises from a: 1. Force Majeure. 2. Failure, or outage, of equipment that does not form part of the Data Communication Facility (DCF). 3. Failure or outage of equipment that affects less than 5% of all Operational Data items of that RME or RCE. 4. Facility that is not available for dispatch. 5. Facility with a Planned Outage on a part of the DCF, that subsequently suffers a Forced Outage on secondary equipment within the DCF being used to support Operational Data transfer. 6. Outage for work to upgrade DCFs to comply with Appendix B, where the AEMO control centre has been notified in advance. 7. Loss of an Intervening Facility. For an Intervening Facility: A loss for more than 3 minutes of the ability to transmit Operational Data to AEMO or receive Control Commands from AEMO, but not where the loss arises from a: 1. Force Majeure. 2. Failure, or outage, of equipment that does not form part of the DCF. 3. Loss of less than 10 minutes that does not affect Dispatch Data. 4. Loss of no more than 5 minutes (or as otherwise agreed with AEMO) arising from a test of DCFs at a disaster recovery site, of which AEMO control centre has been given at least 24 hours' notice. 5. Loss of no more than 5 minutes (or as otherwise agreed with AEMO) arising from a test of a major upgrade of an Intervening Facility, of which AEMO control centre has been given at least 24 hours' notice. 6. Loss arising from a loss of DCFs of a Data Concentrator, RME or RCE. 7. Outage of equipment in an AEMO DCF with no standby available. For a High-Resolution Time Synchronised Data Recorder: An unrecoverable loss of data, but not where the loss arises from a: 1. Force Majeure. 2. Failure, or outage, of equipment that does not form part of the DCF. 3. Maintenance of the High-Resolution Time Synchronised Data Recorder.
Data Communication Providers (DCPs)	A provider of Operational Data to AEMO which may be a Network Operator, or a Market Participant. Reference of DCPs is provided in Appendix B.
Data Communication Facility (DCF)	A generic term used to denote any part of equipment used to transmit Operational Data from one site to another, and includes: 1. The part of RME and RCE providing analogue to digital conversion functions. 2. The part of RME and RCE providing data communication functions. 3. Telecommunications equipment and media, including routing and switching devices. 4. Any Data Concentrator. 5. High-Resolution Time Synchronised Data Recorders. 6. Power supply equipment for items 1 to 5 above. Reference of DCF is provided in Appendix B.

Data Concentrator	A DCF that: 1. Communicates with an Intervening Facility. 2. Collects data from multiple RMEs. 3. Relays Control Commands to RCE.
Deadband	A Deadband is a region of values where a change in the value of data will not result in activation of data transmission. A Deadband is necessary to prevent repeated transmission of data where it has not changed significantly.
Discrete Value	A digital representation of one of a limited set of values (for example a transformer tap position).
Dispatch Data	Data that represents: 1. The dispatch of Registered Facilities, including Dispatch Instructions and reactive power; 2. The status, or the amount, of Ancillary Services or Essential System Services; or 3. Other data used in the dispatch process.
Energy Management System (EMS)	A system used to monitor and control elements of the SWIS in real time.
Facility Operation Agreement	An agreement entered into between AEMO and a Market Participant detailing the agreed arrangements for operational control over aspects of the Market Participant's Facility
Force Majeure	An event or effect which is neither anticipated, nor controllable, by the affected parties, including acts of nature, governmental interventions and acts of war.
High Resolution SCADA Data	Measurements of the following types of data: 1. System frequency. 2. Electrical Time (which is a measure of time that can be derived from the frequency of a power system).
High-Resolution Time Synchronised Data	Measurements of the following types of information but not limited to: 1. Substation busbar voltage, current, real and reactive power output (MW and MVAr) and frequency; and 2. Circuit breaker and protection devices status.
High-Resolution Time Synchronised Data Recorder	Equipment installed to collect High-Resolution Time Synchronised Data
Inter-Control Centre Communications Protocol (ICCP)	The ICCP, also known as the Telecontrol Application Service Element (TASE.2) protocol, is an international standard for communications between control centres in the electrical power sector. This ICCP protocol is formally referred to as the IEC60870-6 TASE.2 and its extensions secure ICCP.
Intervening Facility	A DCF that: 1. Receives Polls from AEMO's control centre; 2. Collects data from RME and relays that data to AEMO control centre; or 3. Relays Control Commands from AEMO control centre to RCE. Does not include any Facility provided by AEMO. Reference of Intervening Facility is provided in Appendix B.
Operational Data	All data, including Dispatch Data, High Resolution SCADA Data, Power System Data, High-Resolution Time Synchronised Data and Other Data. Reference to Operational Data is provided in Appendix B.

Other Data	Data that represents: 1. Status Indications 2. Discrete Values 3. Analogue Value 4. Control Commands; or 5. Any other data which is not Dispatch Data, High Resolution SCADA Data, Power System Data and High-Resolution Time Synchronised Data.
Poll	An electronic request sent from a AEMO control centre or an Intervening Facility to a Facility or a Network substation to request Status Indications, Discrete Values or Analogue Values.
Power System Data	Data concerning: 1. all equipment within; or 2. Registered Facilities directly connected to, a substation containing equipment that operates at a nominal voltage of at least 66kV, unless otherwise agreed by AEMO with regard to specified locations.
Remote control equipment (RCE)	Equipment installed to enable control of a Facility from a control centre.
Remote monitoring equipment (RME)	Equipment installed to enable monitoring of a Facility from a control centre.
Routine Testing	Regular and methodical checking that may require testing and calibration of equipment.
Scale Range	The range of measurements for an Analogue Value that can be represented by a digital value.
Status Indication	The state of a device that has a finite number of discrete states. It includes switching and control indications and alarm conditions.
Supervisory Control and Data Acquisition (SCADA)	Supervisory Control and Data Acquisition (SCADA) is a system that is used to monitor and control field device(s) at remote locations.

1.3. Interpretation

1.3.1. The following principles of interpretation apply in this Procedure unless the context requires otherwise.

(a) Clauses 1.3 to 1.4 of the WEM Rules apply in this Procedure.

(b) References to time are references to Australian Western Standard Time.

(c) Terms that are capitalised, but not defined in this Procedure, have the meaning given in the WEM Rules.

(d) A reference to the WEM Rules or WEM Procedures includes any associated forms required or contemplated by the WEM Rules or WEM Procedures.

(e) Words expressed in the singular include the plural and vice versa.

(f) A reference to a paragraph refers to a paragraph of this Procedure.

(g) A reference to a clause refers to a clause or section of the WEM Rules.

(h) References to WEM Rules in this Procedure in bold and square brackets [Clause XXX] are included for convenience only, and do not form part of this Procedure.

(i) References to particular Technical Rules within this Procedure in bold and curly braces {Clause XXX} are included for convenience only and are not part of this Procedure.

(j) Text located in boxes and headed as Explanatory Note X in this Procedure is included by way of explanation only and does not form part of this Procedure.

1.4. Related documents

The documents in Table 2 are associated with this Procedure.

Table 2 Related documents

Reference	Title	Location
WEM Rules	Wholesale Electricity Market Rules	Energy Policy WA Website
Technical Rules	Technical Rules Revision 3 (1 December 2016)	Economic Regulation Authority Website
ABC and AGC Interface Requirements	ABC and AGC Interface Requirements	AEMO Website
IMS Interface	IMS Interface Market Procedure – Network Operators and AEMO	AEMO Website
Operational Data Points	Technical Specification for Operational Data Points	AEMO Website
Commissioning Tests	WEM Procedure: Commissioning and Testing	AEMO Website
Dispatch	WEM Procedure: Dispatch	AEMO Website
Power System Security	WEM Procedure: Power System Security	AEMO Website
Frequency Co-Optimised Essential System Services Accreditation	WEM Procedure: Frequency Co-Optimised Essential System Services Accreditation	AEMO Website
Balancing Facility Requirements	Market Procedure: Balancing Facility Requirements	AEMO Website

2. OPERATIONAL COMMUNICATIONS AND CONTROL SYSTEMS REQUIREMENTS

2.1. General Requirements

2.1.1. AEMO must document the communications and control system requirements including backup communication and control requirements where the primary methods are unavailable, necessary to support the dispatch process including for issuing Dispatch Instructions [Clause 2.35.4].

2.1.2. AEMO may specify SCADA data points required for each Registered Facility and each Facility that is intended to be registered. These could be in addition to those required by the Network

Operator under the Technical Rules and other relevant statutory instruments.

2.1.3. AEMO must develop a Technical Specification for Operational Data Points, which must be published on the WEM Website, and may be revised from time to time, which details the general SCADA data points required for:

(a) Registered Facilities and each Facility intended to be registered to participate in the WEM; and

(b) provision of each Ancillary Service or Essential System Service.

2.1.4. AEMO may consult with Rule Participants when revising the Technical Specification for Operational Data Points under paragraph 2.1.3, and must notify Rule Participants of any revisions.

2.1.5. AEMO must use the Technical Specification for Operational Data Points in determining the required SCADA points for a Facility under paragraph 2.1.2.

2.1.6. Rule Participants must install and maintain any upgrades, replacements, modifications or repairs to communications or control systems, including SCADA points required under paragraph 2.1.2, in accordance with the specifications in Appendix B.

2.1.7. Where Rule Participants are required to make changes to their Facilities in order to meet the requirements in paragraph 2.1.6, including as a result of a direction issued by AEMO under paragraph 5.2, the changes must be made within a reasonable timeframe agreed between the relevant Rule Participant and AEMO.

2.1.8. AEMO may revise the SCADA data points requirements in paragraph 2.1.2 at any time.

2.1.9. Where AEMO determines that it requires a Rule Participant to provide High-Resolution Time Synchronised Data in order to meet any of the requirements under clause 2.36A.5(b), unless otherwise specified in this Procedure, the Rule Participant must provide the High-Resolution Time Synchronised Data in accordance with the specifications outlined in Appendix B.

2.2. Specific Requirements – Balancing Facilities

2.2.1. Balancing Facilities that do not have special conditions imposed on them by AEMO under paragraph 2.3.1 and are not exempt under paragraph 4.2, must:

(a) be able to receive and confirm receipt of Dispatch Instructions, Dispatch Orders and Operating Instructions from AEMO via SCADA, as described in the ABC and AGC Interface Requirements, or AEMO's nominated IT systems;

(b) have SMS or email capability that is able to receive Dispatch Instructions, Dispatch Orders and Operating Instructions from AEMO; and

(c) have at least two independent telephone services or other voice communications in place for communication with AEMO, which must be available 24 hours a day, seven days a week, as a back-up mechanism for AEMO's SCADA system or AEMO's nominated IT systems.

2.3. Specific Requirements – Balancing Facilities with special conditions imposed

2.3.1. In accordance with Market Procedure: Balancing Facility Requirements, AEMO may determine that a Balancing Facility, with a rated capacity of less than 10 MW, does not meet the relevant specifications of the Balancing Facility Requirements and may impose special conditions on the Balancing Facility in order for it to participate in the Balancing Market.

2.3.2. Balancing Facilities that have special conditions imposed on them must comply with the following communications requirements:

(a) internet access via AEMO's nominated IT Systems as published on the WEM Website;

(b) telephone services or other voice communications; and

(c) communications in place for the receipt of Dispatch Instructions being either:

(i) SMS;

(ii) e-mail; or

(iii) another method approved by AEMO.

2.3.3. A Facility is not required to comply with paragraph 2.3.2 if:

(a) it is exempt under paragraph 4.2; or

(b) the special conditions imposed by AEMO in accordance with paragraph 2.3.1 specifically exempt the requirements of paragraph 2.3.2.

2.4. Specific Requirements – Facilities providing Load Following Ancillary Service/Regulation

2.4.1. All Facilities providing Load Following Ancillary Services must be connected to AGC as per the ABC and AGC Interface Requirements document.

2.4.2. All Facilities providing Regulation must be connected to AGC as per the WEM Procedure: Frequency Co-Optimised Essential System Services Accreditation[1].

2.4.3. AEMO may determine a maximum communication lag time for:

(a) the maximum allowable time from when a Control Command is issued by AEMO to the time that the Facility responds; and

(b) any control system and communications delay that may allow for any applicable Deadbands.

2.4.4. Where AEMO makes a determination under paragraph 2.4.3, AEMO must advise each relevant Market Participant providing Regulation of that determination, which must be provided in writing and in accordance with the method published on the WEM Website.

2.4.5. All Facilities providing Regulation must comply with the maximum communication lag time determined by AEMO under paragraph 2.4.3.

[1] This may require additional SCADA points as identified in the Technical Specification for Operational Data Points document.

2.5. Specific Requirements – Facilities providing Spinning Reserve/ Contingency Reserve Raise

2.5.1. All Facilities providing Spinning Reserve must have at least two independent methods of voice communication in place for the purpose of communication with AEMO, which must be monitored 24 hours a day seven days a week, unless alternative arrangements are specified in the Ancillary Service Contract.

2.5.2. All Facilities providing Contingency Reserve Raise services must have at least two independent methods of voice communication in place for the purpose of communication with AEMO, which must be monitored 24 hours a day seven days a week unless AEMO approves an alternative arrangement.

2.5.3. Where Facilities are unable to meet the requirements under paragraph 2.5.2, the relevant Market Participant must apply to AEMO for an alternative arrangement as soon as reasonably practicable in accordance with the notification details on the WEM Website.

2.5.4. Upon receiving the proposed alternative arrangement under paragraph 2.5.3, AEMO must assess and advise the Market Participant of the outcome of AEMO's assessment within 10 Business Days or a timeframe otherwise agreed by the Market Participant and AEMO.

2.5.5. AEMO may approve an application for an alternative arrangement under paragraph 2.5.3 where:

(a) the Facility can meet the requirements of Contingency Reserve Raise as specified in the Frequency Co-Optimised Essential System Services Accreditation WEM Procedure; and

(b) the communication method does not compromise Power System Security and Power System Reliability.

2.5.6. AEMO may reject an application for an alternative arrangement where the conditions outlined under paragraph 2.5.5 are not able to be met. In notifying a Market Participant of the outcome of their application, AEMO must include the reason for the rejection of the application.

2.5.7. High-Resolution Time Synchronised Data Recorders must be installed and maintained for all Facilities providing Contingency Reserve Raise services. These must be capable of recording disturbance data for provision to AEMO in accordance with the specifications in Appendix B.5 and must meet the relevant reliability requirements for High-Resolution Time Synchronised Data Recorders in Appendix B.3.

2.5.8. Market Participants providing Contingency Reserve Raise services, or seeking accreditation for Contingency Reserve Raise services, must install High-Resolution Time Synchronised Data Recorders to meet the requirements of paragraph 2.5.7, unless AEMO determines that a Network Operator is to install the High-Resolution Time Synchronised Data Recorder in accordance with paragraph 5.1.

2.6. Specific Requirements – Facilities providing Load Rejection Reserve/ Contingency Reserve Lower

2.6.1. All Facilities providing Load Rejection Reserve must have at least two independent methods of voice communication in place for the purpose of communication with AEMO, which must be monitored 24 hours a day seven days a week, unless alternative arrangements are specified in the Ancillary Service Contract.

2.6.2. All Facilities providing Contingency Reserve Lower services must have at least two independent methods of voice communications in place for the purpose of communication with AEMO, which must be monitored 24 hours a day seven days a week unless AEMO approves an alternative arrangement.

2.6.3. Where Facilities are unable to meet the requirements under paragraph 2.6.2, the relevant Market Participant must apply to AEMO for an alternative arrangement as soon as reasonably practicable in accordance with the notification details on the WEM Website.

2.6.4. Upon receiving the proposed alternative arrangement under paragraph 2.6.3, AEMO must assess and advise the Market Participant of the outcome of AEMO's assessment within 10 Business Days or a timeframe otherwise agreed by the Market Participant and AEMO.

2.6.5. AEMO may approve an application for an alternative arrangement under paragraph 2.6.3 where:

(c) the Facility can meet the requirements of Contingency Reserve Lower as specified in the Frequency Co-Optimised Essential System Services Accreditation WEM Procedure; and

(d) the communication method does not compromise Power System Security and Power System Reliability.

2.6.6. AEMO may reject an application for an alternative arrangement where the conditions outlined under paragraph 2.6.5 are not able to be met. In notifying a Market Participant of the outcome of their application, AEMO must include the reason for the rejection of the application.

2.6.7. High-Resolution Time Synchronised Data Recorders must be installed and maintained for all Facilities providing Contingency Reserve Lower services. These must be capable of recording disturbance data for provision to AEMO in accordance with the specifications in Appendix B.5 and must meet the relevant reliability requirements for High-Resolution Time Synchronised Data Recorders in Appendix B.3.

2.6.8. Market Participants providing Contingency Reserve Lower services, or seeking accreditation for Contingency Reserve Lower services, must install High-Resolution Time Synchronised Data Recorders to meet the requirements of paragraph 2.6.7, unless AEMO determines that a Network Operator is to install the High-Resolution Time Synchronised Data Recorder in accordance with paragraph 5.1.

2.7. Specific Requirements – Facilities providing RoCoF Control Service

2.7.1. All Facilities providing RoCoF Control Services must have at least two independent methods of

voice communication in place for the purpose of communication with AEMO, which must be monitored 24 hours a day seven days a week unless AEMO approves an alternative arrangement.

2.7.2. Where Facilities are unable to meet the requirements under paragraph 2.7.1, the Market Participant must apply to AEMO for an alternative arrangement as soon as reasonably practicable in accordance with the notification details on the WEM Website.

2.7.3. Upon receiving the proposed alternative arrangement under paragraph 2.7.2, AEMO must assess and advise the Market Participant of the outcome of AEMO's assessment within 10 Business Days or a timeframe otherwise agreed by the Market Participant and AEMO.

2.7.4. AEMO may approve an application for an alternative arrangement under paragraph 2.7.2 where:

(e) the Facility can meet the requirements of RoCoF Control Service as specified in the Frequency Co-Optimised Essential System Services Accreditation WEM Procedure; and

(f) the communication method does not compromise Power System Security and Power System Reliability.

2.7.5. AEMO may reject an application for an alternative arrangement where the conditions outlined under paragraph 2.7.4 are not met. In notifying a Market Participant of the outcome of their application, AEMO must include the reason for the rejection of the application.

2.7.6. High-Resolution Time Synchronised Data Recorders must be installed and maintained for all Facilities providing RoCoF Control Services. These must be capable of recording disturbance data for provision to AEMO in accordance with the specifications in Appendix B.5 and must meet the relevant reliability requirements for High-Resolution Time Synchronised Data Recorders in Appendix B.3

2.7.7. Market Participants providing RoCoF Control Services, or seeking accreditation for RoCoF Control Services, must install High-Resolution Time Synchronised Data Recorders to meet the requirements of paragraph 2.7.6 unless AEMO determines that a Network Operator is to install the High-Resolution Time Synchronised Data Recorder in accordance with paragraph 5.1.

2.8. Specific Requirements – Facilities providing Network Control Service, System Restart Service or Dispatch Support Service

2.8.1. The communications and control system requirements for Facilities contracted with AEMO to provide System Restart Service or Dispatch Support Service must be in accordance with the relevant Ancillary Service Contract or other contract required by the WEM Rules.

2.8.2. Facilities providing Network Control Services must meet the requirements specified in paragraph 2.2, unless alternative arrangements are specified by AEMO.

2.9. Specific Requirements – Demand Side Programmes

2.9.1. A Market Customer who operates a Demand Side Programme must provide at least two independent telephone contacts, which must be monitored 24 hours a day, seven days a week to allow AEMO to communicate Dispatch Instructions to the Market Customer during the times specified in Standing Data under clause 1(h)(ix) of Appendix 1 of the WEM Rules.

2.10. Specific Requirements – Network Operator

2.10.1. The Network Operator must make its operational voice communications system available to AEMO for use, for purpose identified in paragraph 2.10.2. This may be via physical access to a phone turret, or through connection to AEMO's operational voice communication system (via communications links provided by AEMO).

2.10.2. The purpose of the operational voice communications system is to provide:

(a) voice communications to the Network Operator's control rooms (primary and co-primary) independent of the public switched telephone network; and

(b) voice communications to Market Participants, independent of the public switched telephone network (where the list of Market Participants is to be specified by AEMO).[2]

2.10.3. Obligations regarding confidentiality and retention of historical records in relation to this paragraph 2.10 are specified in the IMS Interface Market Procedure – Network Operators and AEMO.

3. LOSS OF COMMUNICATION SYSTEMS

3.1.1. Where a major loss of communications occurs, the electronic data, control systems and voice communication circuits referred to in paragraph 2 of this Procedure may become unavailable. Where a Facility continues to operate after a major loss of communications, the Market Participant and AEMO must revert to voice communications, including the use of back-up voice communications where appropriate, for the delivery of Dispatch Instructions, Dispatch Orders, Operating Instructions and other operational information.

3.1.2. In the event indicated in paragraph 3.1.1 of this Procedure, where available AEMO may use the Network Operator's operational voice communications system referred to in paragraph 2.10.1, to support the dispatch process and manage Power System Security and Power System Reliability.

3.1.3. Where AEMO's control centre has been evacuated and dispatch services shift to AEMO's emergency control centre, AEMO will issue a Dispatch Advisory with appropriate alternative contact details

3.1.4. Where a Market Participant can no longer comply with the communications requirements outlined in paragraph 2, due to a major loss of communications, the relevant Market Participant must advise AEMO as soon as practicable, that the back-up contact details are to be used for the purposes of communicating with the relevant Facility or Facilities.

3.1.5. Where there is a complete loss of ICCP communication between AEMO and a Network Operator, AEMO may issue directions to the Network Operator under clauses 3.4.4 and 3.5.5 to provide support in maintaining Power System Security and Power System Reliability.

[2] The Technical Rules {Clauses 3.3 and 3.6.9(d)} currently only require back-up voice communications for generators with a capacity of 10MW or greater and generators above 1MVA that have been deemed to require this.

4. GENERATORS OPERATED BY AEMO

4.1. Application

4.1.1. AEMO must enter into a Facility Operation Agreement with a Market Participant for the purposes of clause 7.8.1 where:

(a) Facilities, other than Facilities in the Balancing Portfolio, are accredited to provide Load Following Ancillary Services; or

(b) AEMO has otherwise agreed to maintain control of a Facility following a request from a Market Participant.

E[A] Explanatory note – Generators Operated by AEMO

This explanatory note is to confirm that Dispatch Instructions issued and acknowledged via SCADA (i.e. Automatic Balancing Control - ABC) is not considered to be operational control over aspects of a Facility and does not require a Facility Operation agreement to be executed between AEMO and a Market Participant. The important distinction between ABC and Load Following Ancillary Service (LFAS) is that while AGC is actively controlling the facility when providing LFAS, ABC is providing a representation of a Dispatch Instruction (issued via the AGC system) and an acknowledgement mechanism via SCADA. The AGC Control Status indication is set by the Facility locally and determines whether the Facility is able to respond to dispatch signals from SCADA. If this is 'Off', the Facility is under local control.

4.1.2. AEMO may only operate the Registered Facilities specified in paragraph 4.1.1 if a Facility Operation Agreement detailing the mechanism and limitations of control has been executed between AEMO and the relevant Market Participant.

4.1.3. The Facility Operation Agreement referred to in paragraph 4.1.2 must include a specification of the protocols and electronic interfaces to be used by AEMO in carrying out the remote operation of the Facility (SCADA technical specification).

4.2. Exemption of communications requirements for Facilities operated by AEMO

4.2.1. If a Facility is operated by AEMO under paragraph 4.1.2 of this Procedure, AEMO may exempt a Registered Facility from meeting one or more of the requirements of paragraphs 2.2.1 or 2.3.2 as applicable.

4.3. Automatic execution of Dispatch Instruction through AGC

4.3.1. If permitted under the Facility Operation Agreement referred to in paragraph 4.1.2 of this Procedure, AEMO may give effect to Dispatch Instructions relating to this Facility via AGC signals.

5. REQUIREMENTS NECESSARY TO REMOTELY MONITOR THE PERFORMANCE OF THE SWIS

5.1. Determination of provision of High-Resolution Time Synchronised Data

5.1.1. AEMO may determine that a Network Operator is required to provide High-Resolution Time Synchronised Data for the purposes of supporting Market Participants' accreditation of an Essential System Service [Clause 2.36A.2].

5.1.2. In determining whether to direct a Network Operator under clause 2.36A.2, AEMO must take into consideration the following factors:

(a) Whether the Network Operator already has a High-Resolution Time Synchronised Data Recorder installed at the relevant Facility that is capable of, and has available spare channels to capture the required High-Resolution Time Synchronised Data in accordance with the disturbance recording specifications in Appendix B.5.2 of this Procedure.

(b) Whether the High-Resolution Time Synchronised Data Recorder installed by a Market Participant meets the required disturbance recording specifications in Appendix B.5.2 of this Procedure.

(c) Whether the performance of the Facility is best measured at a location on the Network Operator's Network.

(d) Additional measurements determined by AEMO that are needed on the Network Operator's Network to support the monitoring of the performance of the SWIS.

(e) If the required measuring information cannot be measured by the Network Operator from a location on its Network, or other factors notified to AEMO by the Network Operator that would preclude the Network Operator from providing the required High-Resolution Time Synchronised Data.

5.2. Direction to a Rule Participant

5.2.1. Where AEMO determines that it is reasonably necessary to issue a direction to a Rule Participant under clauses 2.36A.1 and 2.36A.2, AEMO must:

(a) identify the required changes (consulting with the relevant Rule Participant where appropriate);

(b) document the required changes in the direction;

(c) issue the direction to the Rule Participant; and

(d) where applicable, notify other relevant Rule Participants.

5.2.2. If a Rule Participant receives a direction from AEMO under paragraph 5.2.1, it must respond to AEMO within 10 Business Days with a proposed implementation timeframe.

5.2.3. If AEMO receives a response under paragraph 5.2.2, it must, within 10 Business Days of receipt, advise the Rule Participant in writing of whether it agrees or disagrees with the proposed implementation timeframe.

5.2.4. Where AEMO agrees with the proposed implementation timeframe, the Rule Participant must implement the changes within that proposed timeframe [Clause 2.36A.3].

5.2.5. Where an implementation timeframe cannot be agreed by AEMO and the Rule Participant, AEMO, acting reasonably, will determine and specify the implementation timeframe and the Rule Participant must implement the changes within that timeframe [Clause 2.36A.3].

5.3. Provision of Market Participant SCADA Data

5.3.1. Where a Network Operator provides a Market Participant's SCADA data to AEMO, that Network Operator must, acting reasonably, implement the requirements specified under paragraph 2.1.2 by the timeframe determined in paragraph 2.1.7 of this Procedure. In implementing any requirements under paragraph 2.1.2, the Network Operator must include any associated changes required to the Network Operator's EMS and to the ICCP configuration as detailed in the IMS Interface Market Procedure – Network Operators and AEMO.

5.3.2. AEMO may issue a direction under paragraph 5.2.1 of this Procedure to meet the requirements of paragraph 5.3.1 of this Procedure.

5.3.3. A Network Operator must consult with AEMO to determine any specific SCADA requirements for new or modified Market Participant Facilities {Clauses 3.3.4 and 3.4.10}.

5.4. Provision of High-Resolution Time Synchronised Data Recorder by a Network Operator

5.4.1. If AEMO issues a direction to a Network Operator under paragraph 5.2.1 in relation to clause 2.36A.2, the Network Operator must install, upgrade and maintain all necessary measurement equipment required to support the provision of High-Resolution Time Synchronised Data at the locations on the Network Operator's Network, and for the data requirements specified by AEMO.

5.4.2. The High-Resolution Time Synchronised Data Recorder(s) specified under paragraph 5.4.1 must be capable of monitoring and recording the dynamic performance of the power system during a system disturbance or transient event as specified in Appendix B.5.2.

5.4.3. The High-Resolution Time Synchronised Data Recorder(s) specified under paragraph 5.4.1 must be capable of capturing the following types of measuring information:

(a) substation busbar voltage, current, real and reactive power output (MW and MVAr) and frequency (Hz); and

(b) circuit breaker and protection devices status.

5.4.4. Prior to issuing the direction under paragraph 5.4.1, AEMO must consult with the Network Operator in specifying the location and measuring information requirements for each High-Resolution Time Synchronised Data Recorder.

5.4.5. AEMO in consultation with the Network Operator may determine a list of triggering events for paragraph 5.4.6 to apply to specific locations for each High-Resolution Time Synchronised Data Recorder. Unless otherwise agreed by AEMO, this must include the items specified in Appendix B.5.2 of this Procedure.

5.4.6. As a result of a triggered event for a High-Resolution Time Synchronised Data Recorder, the Network Operator must notify AEMO that the measuring information is available and make the recorded measuring information available to AEMO within 3 Business Days, or a timeframe otherwise agreed by the Network Operator and AEMO. The recorded measuring information must be made available at an agreed server location such that AEMO can retrieve the recorded measuring information at any time.

5.4.7. AEMO may notify a Network Operator that it requires recorded measuring information from a High-Resolution Time Synchronised Data Recorder to be made available at an agreed server location consistent with paragraph 5.4.6.

5.4.8. Network Operators must provide measuring information specified by AEMO in the format specified in Appendix B.5.2 of this Procedure within three Business Days of receiving a notification from AEMO under paragraph 5.4.7, or a timeframe otherwise agreed by the Network Operator and AEMO.

5.4.9. If the measuring information requested under paragraph 5.4.7 is unable to be provided due to the storage capacity of the High-Resolution Time Synchronised Data Recorder, then it is not required to be provided by the Network Operator.

5.4.10. Subject to any agreed variations by AEMO, Network Operators must ensure that all High-Resolution Time Synchronised Data Recorders installed or upgraded in accordance with this paragraph 5.4 meet the specifications in Appendix B.5 of this Procedure, and meet the relevant reliability requirements in Appendix B.3 of this Procedure.

5.5. Provision of High-Resolution Time Synchronised Data Recorders by a Market Participant

5.5.1. Where AEMO directs a Market Participant under paragraph 5.2.1 in relation to clause 2.36A.1 to install, upgrade and maintain a High-Resolution Time Synchronised Data Recorder to meet any of the requirements under clause 2.36.A.5(b), the High-Resolution Time Synchronised Data Recorder(s) must be capable of capturing measuring information, including but not limited to:

(a) the transient and disturbance response of each generating unit in terms of real and reactive power output (MW and MVAr);

(b) the current (A), voltage (V) and frequency (Hz) at the generating unit terminal; and

(c) the current (A) and voltage (V) at the high voltage side of the generating unit's step up transformer.

5.5.2. AEMO may notify a Market Participant that it requires recorded measuring information from a High-Resolution Time Synchronised Data Recorder.

5.5.3. A Market Participant upon receiving a notification from AEMO, must provide measuring information specified by AEMO in the format specified in Appendix B.5.2 within three Business Days of receiving a notification from AEMO, or a timeframe otherwise agreed by the Market Participant and AEMO.

5.5.4. If the measuring information requested under paragraph 5.5.2 is unable to be provided due to the storage capacity of the High-Resolution Time Synchronised Data Recorder, then it is not required to be provided by the Market Participant.

5.5.5. Market Participants must ensure that all High-Resolution Time Synchronised Data Recorders installed or upgraded in accordance with paragraph 5.5 meet the specifications in Appendix B.5 and the relevant reliability requirements in Appendix B.3.

6. DATA COMMUNICATIONS

6.1. Data Communications Standard

6.1.1. The communication and control requirements (including backup communication and control requirements where the primary methods are unavailable) necessary to support the dispatch process under clause 2.35.4 are specified in Appendix B.

6.1.2. Where a Network Operator or Data Communication Provider is required to modify equipment to meet the requirements referred to in paragraph 6.1.1, the changes must be made within a reasonable timeframe agreed between AEMO and the Network Operator or Data Communication Provider.

6.2. SCADA System and EMS Data via ICCP

6.2.1. The requirements for the ICCP link between AEMO and Network Operators for the provision of data are detailed in Appendix B.

6.2.2. AEMO must specify the data to be sent by the Network Operator to AEMO via the ICCP link in the ICCP Data Requirements Document, which may include controls and indications (analogue and discrete).

6.2.3. AEMO must provide the ICCP Data Requirements Document to the Network Operator and may update the document from time to time and must notify the Network Operator of any changes as soon as reasonably practicable.

6.2.4. Network Operators must configure and maintain their interface to the ICCP link to support the data requirements specified by AEMO under paragraph 6.2.2.

6.2.5. The configuration of the ICCP link to enable the data to be sent will be based on an agreement between AEMO and the Network Operator. Each party will be responsible for its own infrastructure implementation and maintenance costs.

6.2.6. Where a Network Operator is required to modify equipment to meet the requirements referred to in paragraph 6.2.1 or the specifications in paragraph 6.2.2, the changes must be made within a reasonable timeframe agreed between AEMO and the Network Operator.

6.3. Security

6.3.1. DCPs must put in place adequate cyber security measures to ensure that all installations under paragraphs 6.1 and 6.2 are properly maintained, operated and secured, so as not to compromise, or cause any adverse impact to the security, reliability and stability of the power system.

6.3.2. Any ICCP link installed to meet the requirements of paragraph 6.2.4 must be configured to be a secure ICCP link, utilising the available encryption within the ICCP protocol.

6.3.3. Both AEMO and the Network Operator are individually responsible for the management of the security encryption certificates necessary to meet the requirements of paragraph 6.3.2.

6.4. Configuration, Maintenance, Testing, Data Management and co-ordination

6.4.1. DCPs must notify AEMO of any planned maintenance, testing, data management, configuration activities or other activities that may limit the DCF's capability to provide any required Operational Data, except where the DCP is required to submit Outage Plans for DCFs to AEMO, or unless otherwise agreed by AEMO in an Operating Protocol.

6.4.2. DCPs must use reasonable endeavours to provide notifications under paragraph 6.4.1 at least 10 Business Days prior to the commencement of the planned activities. Notification must be provided as per the method published on the WEM Website.

6.4.3. If AEMO identifies an issue with the planned activities notified to it under paragraph 6.4.1 of this Procedure, AEMO must inform the DCP and the DCP must coordinate with AEMO to re-schedule the activities to an alternative time.

6.4.4. DCPs must provide information to AEMO on request, and within a reasonable timeframe agreed between DCPs and AEMO, to support investigations and confirmation that the standards specified in this Procedure are being met.

APPENDIX A. RELEVANT CLAUSES OF THE WEM RULES

Table 3 details:

(a) the head of power clauses in the WEM Rules under which the Procedure has been developed; and

(b) each clause in the WEM Rules requiring an obligation, process or requirement be documented in a WEM Procedure, where the obligation, process or requirement has been documented in this Procedure.

Table 3 Relevant clauses of the WEM Rules

Clause
2.34A.13(a)(iv)
2.34A.13(a)(v)
2.35.4
2.36A.1
2.36A.2
2.36A.3
2.36A.4
2.36A.4A
2.36A.5.(a)
2.36A.5.(b)
2.36A.5.(c)
2.36A.5.(d)
2.36A.5.(e)
2.36A.6

APPENDIX B. DATA COMMUNICATION STANDARD FOR THE WEM

DCPs must apply the following Data Communication Standard (Standard) when providing and maintaining communications Facilities and back-up Facilities that transmit data to and from AEMO.

B.1 General structure of DCFS

B.1.1 Figure 1 illustrates the relationships between:

(a) AEMO control centres;

(b) Intervening Facilities;

(c) Data Concentrators;

(d) RME/ RCE; and

(e) High-Resolution Time Synchronised Data Recorder.

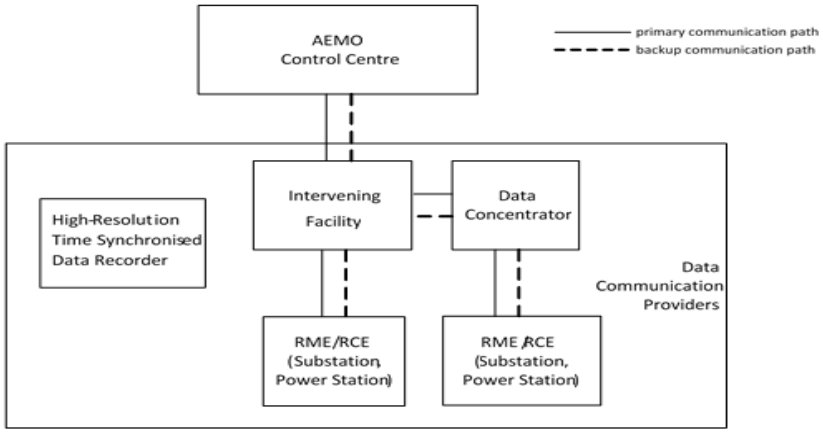

Figure 1 Relationships between AEMO and Data Communication Providers

B.2 Performance

B.2.1 Quantity of data

B.2.1.1 DCFs must be capable of transmitting all Operational Data required by AEMO, including data that:

(a) was in use at the time this Standard came into effect;

(b) has been requested in writing by AEMO; and

(c) has not been subsequently rejected in writing by AEMO.

E[B] Explanatory note – Transmission of additional Operational Data

Operational Data beyond that required by AEMO under the WEM Rules, or any agreement between AEMO and a DCP, (for example data required by a Network Operator) does not diminish the obligations of the DCP to comply with this Standard

B.2.2 Representation of data

B.2.2.1 DCFs must transmit Operational Data to and from AEMO in accordance with this section

B.2.2.2 Analogue Data must be transmitted:

(a) with the sign convention nominated by the DCP from which the data originates; and

(b) with the resolutions specified in Table 4.

Table 4 Resolution required for Analogue Data

Category of Analogue Data	Resolution (Max % of Scale Range)
Dispatch Data	0.1
Power System Data	0.2
Other Data	1.0

B.2.2.3 Analogue Values, Status Indications and Discrete Values must be transmitted in accordance with the ICCP standard.

B.2.2.4 Control Commands must be transmitted in accordance with the ICCP standard.

B.2.2.5 Quality of data indicators must indicate:

(a) whether there is a sustained communication failure lasting 30 seconds or more between an Intervening Facility and RME (including failure of a relevant Data Concentrator); and

(b) whether a value has been overridden at any RME, Data Concentrator or Intervening Facility.

B.2.3 Age of Data

B.2.3.1 Operational Data in response to a Poll must be able to be transmitted to AEMO at all times and within the time intervals specified in Table 5, unless otherwise agreed between AEMO and the Rule Participant or Network Operator. The time interval is calculated from the instant the data first gets converted to digital form.

Table 5 Time intervals for data to be available for transmission to AEMO

Category	Data Type	Time Interval (seconds)	Time Interval via Data Concentrator (seconds)
High Resolution SCADA Data	Analogue Value	2	2
Dispatch Data	Status Indication	6	7
	Analogue Value	6	7
	Discrete Value	6	7
Power System Data	Status Indication	8	9
	Analogue Value	14	15
	Discrete Value	14	15
Other Data	Status Indication	12	13
	Analogue Value	22	23

Category	Data Type	Time Interval (seconds)	Time Interval via Data Concentrator (seconds)
	Discrete Value	22	23

B.2.3.2 A Status Indication is considered converted to digital form when the digital signal representing it is carried by circuits that are not used solely for that Status Indication.

B.2.3.3 Status Indications and Discrete Values do not have to be re-transmitted for up to five minutes if the relevant data has not changed since the last transmission.

B.2.3.4 Analogue Values do not have to be re-transmitted for up to five minutes if the relevant data has not changed by the relevant Deadband amount shown in Table 6.

Table 6 Deadband for analogue data transmission

Category of Analogue Data	Deadband (% of Scale Range)
Dispatch Data	0.2
Power System Data	0.5
Other Data	0.5

B.2.3.5 An Intervening Facility must respond to Polls once per second.

B.2.4 Control Command Delay

B.2.4.1 DCPs must relay Control Commands to the relevant RCE within three seconds of receiving a Control Command from AEMO or within four seconds if transmitted via a Data Concentrator.

B.3 Reliability

B.3.1 Reliability Requirements

B.3.1.1 The total period of Critical Outages for a RME, RCE and High-Resolution Time Synchronised Data Recorder in a rolling 12-month assessment period must be no greater than those indicated in Table 7, unless otherwise agreed by AEMO in relation to specified locations. AEMO will monitor the performance of the DCF devices based on information available, and may direct Participants to correct performance in accordance with paragraph 5.2.

B.3.1.2 The total period of Critical Outages of an Intervening Facility over a rolling 12-month assessment period must be no greater than those indicated in Table 8. AEMO will actively monitor the performance of the Intervening Facility by monitoring Operational Data availability.

B.3.1.3 If, in any rolling 12-month assessment period, the total period of Critical Outages exceeds the periods indicated in Table 7 or Table 8 as applicable, the responsible DCPs must take reasonable corrective action, as determined between AEMO and the relevant Network Operator or Market Participant, to bring the total period within the limits required by paragraph B.3.1.1 or B.3.1.2, as applicable.

Table 7 Total period of Critical Outages of RME, RCE and High-Resolution Time Synchronised Data Recorder over a 12-month period

Category of DCF	Total measure of Critical Outages
Dispatch Data where there is no agreed substitute data	6 hours
Dispatch Data where there is agreed substitute data	12 hours
RCE	24 hours
High-Resolution Time Synchronised Data Recorder	>95% availability

Table 8 Total period of Critical Outages of an Intervening Facility over a 12-month period

Category of Intervening Facility	Period per Critical Outage	Total Period of Critical Outages
Dispatch Data	30 minutes	2 hours
Power System Data and Other Data	1 hour	6 hours

B.3.2 Redundant elements

B.3.2.1 Where necessary, DCFs must have sufficient redundant elements to reasonably satisfy the reliability requirements set out in paragraph B.3.1, taking into account:

(a) the likely failure rate of their elements;

(a) the likely time to repair of their elements; and

(b) the likely need for planned outages of their elements.

B.3.3 Response to failure of High-Resolution Time Synchronised Data Recorder(s)

B.3.3.1 In response to a High-Resolution Time Synchronised Data Recorder failure, the Network Operator or Market Participant must:

(a) Respond to the failure and rectify the High-Resolution Time Synchronised Data Recorder(s) as soon as practicable, which must be no more than 10 Business Days after the date on which the Network Operator or Market Participant becomes aware of the failure or a timeframe otherwise agreed between the Rule Participant and AEMO; and

(b) If the Network Operator or Market Participant is unable to rectify the High-Resolution Time Synchronised Data Recorder(s) in accordance with paragraph B.3.3.1(a), the Network Operator or Market Participant must notify AEMO as soon as practicable, and provide a rectification plan to AEMO within 5 Business Days.

B.4 Interfacing

B.4.1 Physical and logical Interfaces

B.4.1.1 Where AEMO agrees to extend its Wide Area Network (WAN) to DCP's DCFs, each relevant DCP must establish a physical connection to an AEMO-designated port on an AEMO router and it must use Ethernet and TCP/IP protocols.

B.4.1.2 Where AEMO agrees that a DCP may establish a logical connection to AEMO's WAN, the DCP must develop a digital communications service between the DCP's DCFs and an AEMO-designated network access facility.

B.4.2 Data communication protocols

B.4.2.1 Any communication of Operational Data through a physical or logical interface with AEMO must use the secure ICCP TASE.2 protocol.

B.5 Recorder Specification

B.5.1 General

B.5.1.1 High-Resolution Time Synchronised Data Recorders must be calibrated/checked prior to use.

B.5.1.2 High-Resolution Time Synchronised Data Recorders must be maintained through Routine Testing and in accordance with good electricity industry practice, taking into consideration the respective original equipment manufacturers' recommendation.

B.5.1.3 High-Resolution Time Synchronised Data Recorders must not interact with any equipment control functions.

B.5.2 Technical Specification

B.5.2.1 High-Resolution Time Synchronised Data Recorders installed in the WEM must be suitable for both disturbance[3] and transient[4] recording. The basic measuring information indicated in paragraph 5.4.3 and 5.5.1 are to be recorded/monitored in accordance with the specifications in Table 9:

Table 9 Specifications for High-Resolution Time Synchronised Data Recorders

Specification of recorder	Transient Recording	Disturbance Recording
Recording sample rate (base frequency 50hz)	32-512 Samples/Cycle 1.6-25.6 kHz	0.5-2 Samples/Cycle 25-100Hz
Recording resolution	• Analog Signals: 16 bits or better than 0.1% of Reading Down to 3% of Full-scale • Frequency: ±5mHz or lower	
Trigger Event Type[5]	Undervoltage	90% of Nominal Voltage
	Underfrequency Generation Site	49.8Hz
	Underfrequency Non-Generation Site	49.7Hz
	Overvoltage	110% of Nominal Voltage
	Over frequency Generation Site	50.2Hz
	Over frequency Non-Generation Site	50.3Hz
	RoCoF	0.5Hz/2cycles
Pre-trigger data event length	0.1 second minimum	10 second minimum
Post-trigger data event length	1.5 second minimum for recording	3 minutes minimum for recording

[3] Any perturbation to the power system. Generally, these are short term events and are typically 20 to 60 cycles in length but may be longer if multiple protection operations are required to clear the fault.

[4] These events are very short in duration and are typically 8 cycles for high speed clearing and 16 cycles for sequential line clearing.

[5] Default trigger event type settings unless specified otherwise.

Specification of recorder	Transient Recording	Disturbance Recording
Safety Window	4 cycles – number of 'clear' cycles that must occur at the end of the recording	30 sec to 2 minutes. Recording time after active trigger
Storage Capacity	• 400 events minimum • Must include local storage on site • Recording time at least 14-day period (based on recording sample rate)	
Event Data Format	• IEEE Comtrade (Preferred by AEMO) • ASCII or • Spreadsheet	
Time Stamping	A Global Position Satellite (GPS) clock must be provided for time synchronization and must have a minimum resolution of 1msec	

B.5.3 High-Resolution Time Synchronised Data Recorder Standard

B.5.3.1 High-Resolution Time Synchronised Data Recorder must conform to the following standards unless an otherwise acceptable standard can be demonstrated and agreed with AEMO:

(a) IEEE/IEC 60255-118-1-2018[6] Part 118-1: Synchrophasor for power systems – measurements, in relation to:

(i) the definitions of synchronised phasor (Synchrophasor), frequency and rate of change of frequency measurements;
(ii) descriptions of time tag and synchronisation requirements for measurement of all three of these quantities specified in (i); and
(iii) methods for evaluating these measurements and requirements for compliance with the standard under both static and dynamic conditions[7];

and

(b) IEEE C37.118.2-2011, in relation to:

(i) the definition of the method for exchange of synchronised phasor measurement data between power system equipment; and
(ii) messaging between phasor measurement units (PMU), phasor data concentrators (PDC), and other applications, including types, use, contents, and data formats for real-time communication[8].

[6] IEEE/IEC International Standard - Measuring relays and protection equipment

[7] Note that a phasor measurement unit (PMU), can be a stand-alone physical unit or a functional unit within another physical unit, however the standard does not specify hardware, software or a method for computing phasors, frequency, or rate of change of frequency

[8] Note that this revision of the standard includes communications between a single PMU and a PDC, PDC functions dealing with multiple PMUs, and onwards communications from the PDC

E[C] Explanatory Note – General structure of DCP, DCF, Intervening Facilities and Operational Data.

This diagram is to provide an understanding on the general structure of DCP, DCF, Intervening Facilities and Operational Data.