GAS METERING – CTM DATA REQUIREMENTS

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VERSION RELEASE HISTORY

Version	Effective Date	Summary of Changes
1.0	June 2001	First Issue.
2.0	September 2003	Changed to new format and~~&~~ updated array tables plus minor editorial.
3.0	May 2009	Changed to include some common new arrays and 6~~-~~am start of gas day.
4.0	July 2010	Disclaimer added.
5.0	September 2016	New arrays added for multirun metering installations. Diagnostic tools heading removed, diagnostic points are present in other arrays.

CONTENTS

1. INTRODUCTION

1.1 Purpose and Scope

This ~~procedure~~ document sets out ~~the~~ AEMO's requirements relating to ~~for~~ the transmission of data from Custody Transfer Meters (CTMs~~s~~) associated with the Declared Transmission System (DTS) ~~(DTS)~~ operated by AEMO.

~~This procedure applies to all CTMs except those that have derogations under the NGR. Where there is an apparent discrepancy between these guidelines and the NGR, the NGR will be taken as correct.~~

This ~~procedure~~ document covers the CTM ~~the metering installation d~~data to be transmitted to AEMO under the AEMO Wholesale Market Metering Communications Procedures. It applies to all CTMs except those that have derogations under the National Gas Rules (NGR).

~~By agr~~These requirements ~~eement, this procedure~~ can also be applied to meters not associated with the ~~Gas Declared Transmission System~~DTS ~~Transmission~~ where agreed by the ~~parties~~AEMO and the *responsible person*~~System operated by AEMO~~.

The NGR and the National Gas Law (NGL) prevail over this document to the extent of any inconsistency.

1.2 Definitions and Interpretation

1.2.1 Glossary

The words, phrases and abbreviations set out below have the meanings set out opposite them when used in this document~~ese Procedures~~.

Terms defined in the NGL or the NGR have the same meanings in this document~~ese Procedures~~ unless otherwise specified in this clause. Those ~~Defined~~ terms are intended to be identified in this document~~ese Procedures~~ by italicising them, but failure to italicise a defined term does not affect its meaning.

Term	Definition
AEMC	Australian Energy Market Commission.
C~~c~~onnection point	A delivery point, a transfer point or a receipt point.
CTM	Custody Transfer Metering facility (~~which~~ includes the metering equipment, RTU, and associated field data processing systems).
DTS	Declared Transmission System.
GC	Gas Chromatograph.
GCD	Gas Composition Data.
~~GOE~~	~~Gas Operations Engineer~~
~~GSP~~	~~*Gas Scheduling Procedures* (AEMO publication)~~
HV	Heating Value (the Higher Volumetric HV is used for CTM calculations).
Julian time	Time based on Julian calendar as a numbered sequence.
M~~m~~Metering i~~I~~nstallation	means the meter and associated equipment and installations installed as required under NGR Part 19 Division 3 Subdivision 4 for connection points~~the NGR~~.
NGL	National Gas Law.
NGR (Rules)~~—~~	National Gas Rules.
PI	~~Alstom SCADA d~~Data collection and archiving system which stores historical values from AEMO's SCADA system.

Term	Definition
Responsible Person	The person or organis~~z~~ation responsible for providing the metering installation under ~~as defined in~~ the NGR (see rule 292).
RTU	Remote Terminal Unit.
SCADA	Supervisory Control And Data Acquisition – the systems used (among other purposes~~things~~) to collect data from GCs and CTMs and to send data to CTMs.
Standard Conditions	Reference or base conditions of gas measurement (15 °C and 101.325 kPa absolute).

1.3 Related Documents

Reference	Title	Location
AGA 3	Orifice Metering of Natural Gas and Other Related Hydrocarbon Fluids, American Gas Association Report No 3.	Online
AGA 7	Measurement of Gas by Turbine Meters, American Gas Association Report No 7.	Online
AGA 8	Compressibility Factors of Natural Gas and Other Related Hydrocarbon Gases, American Gas Association Report No 8.	Online
API 21	Manual of Petroleum Measurement Standards - Chapter 21 Flow Measurement Using Electronic Metering Systems, American Petroleum Institute.	Online
ISO 6976	Calculation of calorific value, density, relative density and wobbe index from gas composition, International Standards Organisation.	Online
	Gas Quality Standard and Monitoring Guidelines (Declared Transmission System)~~TS)~~	AEMO website
~~NGR~~	~~National Gas Rules~~	~~AEMC website~~
	Wholesale Market Metering Communications Procedures (Victoria)	AEMO website
	Wholesale Market Data Validation Procedures (Victoria)	AEMO website
	~~Gas Quality Standard and Monitoring Guidelines~~	~~AEMO website~~

~~6.~~2. REQUIREMENTS

~~6.1~~2.1 Calculation of energy flow

The rules covering the determination of the energy flow through a metering installation are contained in rule 303 of the NGR. The methodology used within the Remote Telemetry Unit (RTU)~~Remote Terminal Unit (RTU)~~ for ~~the~~ measuring~~ement~~ and recording ~~of~~ flow parameters shall be based on the API 21 "*Flow Measurement using Electronic Metering Systems*" or other appropriate recognised standards.

To avoid ambiguity and ~~to~~ ensure consistency of data supplied to AEMO, the following principles apply:

- The energy content of gas passing through a metering installation shall be expressed in Gigajoules to at least three decimal places.
- The (corrected) volume of gas passing through a metering installation shall be expressed in thousands of standard cubic meters to at least three decimal places. ~~-~~ The reference or base conditions of gas measurement shall be 15 °C and 101.325 kPa absolute.
- The heating value used for ~~the conversion~~ converting ~~of~~ corrected volume flow to energy flow shall be the higher heating value (sometimes referred to as the gross heating value). The heating value shall be calculated on a volumetric basis referenced to "15°C" ISO Standard Reference conditions. The Heating Value shall be expressed in units of MJ/m^3 expressed to at least two decimal places. (Note that MJ/m^3 is equivalent to GJ/thousand standard cubic meters).
- The gas compressibility factor Z is to be calculated using the "Detail Characterisation Method" as described in AGA 8 unless alternative methods can be shown to yield acceptable results and are accepted by AEMO.
- The energy and corrected volume passing through the installation shall be recorded in hourly intervals.
- Where a meter does not pass gas for a full hour, "Hourly Average" readings refer to the average for the entire hour, not just to the time that the meter was passing gas.

~~6.2~~2.2 Time stamping of data

- Australian Eastern Standard Time (AEST) is to be used in data transfers for all time stamping.
- Hourly average data is required for a variety of data points and refers to “hour to hour”, “on the hour” data.
- All readings require a “time stamp” as below:
  - For averaged data, the time stamp relates the start time of a measurement period. For example “hourly average” data for the ~~9:00~~ 1300 to ~~10:00~~ 1400 hrs period would be time stamped 13~~9~~:00:00 ~~am~~. “Daily average” readings are to be referenced to 6:00:00 am ~~Australian Eastern Standard Time~~AEST.
  - For “instantaneous” (i.e. single measurement) readings the time stamp indicates the time of measurement.
  - For the “Top of Hour” (TOH) readings the time stamp relates to the instantaneous measurement at the end of the hour. Thus for the 9:00:00 am time stamped data the TOH data is the data at close to 9:59:59 am. The TOH pressure and TOH temperature is the only data handled in this way.
- The time stamping of data shall be within the tolerances specified in the NGR.

~~6.3~~2.3 Metering Array Data to be available to AEMO

- The following tables give preferred lists of the “standard sets” of metering data required by AEMO. Data are normally made available as data arrays and the following tables are listed by their ~~commonly~~ commonly–used array numbering. Note that the “reverse” arrays are not required for meters that only record flow in a single direction.
- Data are required to enable AEMO to check the validity of energy and volume readings supplied from the metering installation. These data assist in ~~the~~ development of data substitutions in the event of data corruptions.
- The data arrays listed provide sufficient information to recalculate results in the event of a wide range of RTU failures and also provide sufficient data to enable the checking of calculations performed by the RTU.
- Some additional data relates to meter and RTU diagnostics.

~~6.4~~2.4 Overview of standard arrays

The following tables give the preferred list~~s~~ of the “standard sets” of metering data. Variations to these “standard sets” are listed below in the tables.

A large number of “non-standard” arrays are in current use but it is preferred that standard arrays are used for new installations or where existing installations are ~~significantly~~ upgraded.

Array 11	Run 1 forward flow meter hourly data part 1
Array 12	Run 1 forward flow meter hourly data part 2
Array 21	Run 2 forward flow meter hourly data part 1
Array 22	Run 2 forward flow meter hourly data part 2
Array 31	Run 3 forward flow meter hourly data part 1
Array 32	Run 3 forward flow meter hourly data part 2
Array 74	Run 4 forward flow meter hourly data part 1
Array 75	Run 4 forward flow meter hourly data part 2

Array 13	Run 1 reverse flow meter hourly data part 1
Array 14	Run 1 reverse flow meter hourly data part 2

Array 23	Run 2 reverse flow meter hourly data part 1
Array 24	Run 2 reverse flow meter hourly data part 2
Array 33	Run 3 reverse flow meter hourly data part 1
Array 34	Run 3 reverse flow meter hourly data part 2
Array 76	Run 4 reverse flow meter hourly data part 1
Array 77	Run 4 reverse flow meter hourly data part 2

Array 40	Single run forward flow meter hourly data
Array 41	Single run reverse flow meter hourly data
Array 47	Single run forward flow meter hourly average data part 1
Array 48	Single run forward flow meter hourly accumulated data part 2
Array 67	Single run reverse flow meter hourly average data part 1
Array 68	Single run reverse flow meter hourly accumulated data part 2

Arrays 47 and 48 are used instead of a single array 40 where smaller array sizes are required to suit the RTU.

Arrays 67 and 68 are used instead of a single array 41 where smaller array sizes are required to suit the RTU.

Array 50	Single run forward flow meter daily data
Array 51	Single run reverse flow meter daily data

Arrays 81, 82, 83	C6 Gas chromatograph hourly data for stream #1, #2 and #3
Arrays 91, 92	C9 Gas chromatograph hourly data for stream #1 and #2
Array 95	C9 Gas chromatograph hourly data for stream #1 part 1
Array 96	C9 Gas chromatograph hourly data for stream #1 part 2
Array 98	C9 Gas chromatograph hourly data for stream #2 part 1
Array 99	C9 Gas chromatograph hourly data for stream #2 part 2

Arrays 95 and 96 are used instead of a single array 91 where smaller array sizes are required to suit the RTU.

Arrays 98 and 99 are used instead of a single array 92 where smaller array sizes are required to suit the RTU.

Table 1 Hourly Average Forward Flow Historical Data Part 1 – Array 11, 21, 31 and 74

Arrays 11, 21, 31 and 74 – Run 1, Run 2, Run 3 and Run 4 hourly average forward flow data Part 1 respectively.

In the table "#" should be replaced by 1, 2, 3 or 4 as appropriate to the run line.

Column	Item	Units	PI Collect Name	Comments
1	Julian time		HLOG.JULIAN.	Time stamp (Julian time format)
2	Hourly Average Pressure.	kPa g	MF#PRESAH	
3	Hourly Average Temperature	º C	MF#TEMPAH	
4	Hourly Average Uncorr-ected Flow Rate	m^3/ h	MF#VOLFAH	Uncorrected (Actual) volume flow rate
5	Hourly Average Corr-ected Flow Rate	KSCM/ h	MF#VOLBAH	Corrected (Standard or Base) volume flow rate
6	Hourly Average Mass Flow Rate	tonne/ h	MF#MASSAH	kg/h for Coriolis meters
7	Hourly Average Energy Rate	GJ/ h	MF#ENGYAH	
8	Hourly Average Zbase	-	MF#ZEDBAH	Compressibility at reference or base conditions
9	Hourly Average Dbase	kg/ m^3	MF#DENBAH	Gas density at reference or base conditions
10	Hourly Average Zflow	-	MF#ZEDFAH	Compressibility at flowing conditions
11	Hourly Average Dflow	kg/ m^3	MF#DENFAH	Gas density at flowing conditions
12	Hourly Average Relative Density	-	MF#SPGRAH	Normally data sent to the meter or from attached GC
13	Hourly Average Heating Value	MJ/ m^3	MF#HHVVAH	Normally data sent to the meter or from attached GC
14	Daily "Qbit" Error Code	-	MF#QCOD_H	Code indicating error in primary or secondary device
15	Daily "Qbit" Error Time	s	MF#QTIM_H	Elapsed time of error during hour
16	Supercompressibility factor (FPV)	-	MF#FPV_AH (MFS#DENCAH)	Supercompressibility factor (Coriolis measured density for Coriolis)
17	Hourly Average Meter VOS	m/s	MF#VELSAH (NULL)	Velocity of sound (NULL for Coriolis meter)
18	Spare			
19	Spare			

Table 2 Hourly Accumulated Forward Flow Historical Data Part 2 – Array 12, 22, 32 and 75

Arrays 12, 22, 32 and 75 – Run 1, Run 2, Run 3 and Run 4 hourly average forward flow data Part 2 respectively.

In the table "#" should be replaced by 1, 2, 3 or 4 as appropriate to the run line.

Column	Item	Units	PI Collect Name	Comments
1	Julian time		HLOG.JULIAN.	Time stamp (Julian time format)
2	Corrected Volume Hi	M m^3	MF#VOLBNH	Accumulator High non-resetting
3	Corrected Volume Lo	k m^3	MF#VOLBPH	Accumulator Low non-resetting
4	"Top of Hour" Pressure	kPa g	MF#PRES_T	Taken at the end of each hour
5	"Top of Hour" Temperature	^{o} C	MF#TEMP_T	Taken at the end of each hour
6	Elapsed Time Hour	s	MF#ELAP_H	Elapsed time that RTU has been operating during hour.
7	Mass Flow Total Hi	k tonne	MF#MASSNH	Accumulator High non-resetting (kg for Coriolis meters)
8	Mass Flow Total Lo	tonne	MF#MASSPH	Accumulator Low non-resetting (kg for Coriolis meters)
9	Energy Total Hi	TJ	MF#ENGYNH	Accumulator High non-resetting each hour
10	Energy Total Lo	GJ	MF#ENGYPH	Accumulator Low non-resetting each hour
11	Uncorr-ected Vol Hi	k m^3	MF#VOLFNH	Accumulator High non-resetting each hour
12	Uncorrected- Vol Lo	m^3	MF#VOLFPH	Accumulator Low non-resetting each hour
13	Corrected This Hour High	M m^3	MF#VOLBRH	Accumulator High resetting each hour
14	Corrected This Hour Low	k m^3	MF#VOLBSH	Accumulator Low resetting each hour
15	Mass Flow This Hour High	k tonne	MF#MASSRH	Accumulator High resetting each hour
16	Mass Flow This Hour Low	tonne	MF#MASSSH	Accumulator Low resetting each hour
17	Energy Flow This Hour High	TJ	MF#ENGYRH	Accumulator High resetting each hour
18	Energy Flow This Hour Low	GJ	MF#ENGYSH	Accumulator Low resetting each hour

Table 3 Hourly Average Reverse Flow Historical Data Part 1 – Array 13, 23, 33 and 76

Arrays 13, 23, 33 and 76 – Run 1, Run 2, Run 3 and Run 4 hourly average reverse flow data Part 1 respectively.

In the table "#" should be replaced by 1, 2, 3 or 4 as appropriate to the run line.

Column	Item	Units	PI Collect Name	Comments
1	Julian time		HLOG.JULIAN.	Time stamp (Julian time format)
2	Hourly Average Pressure	kPa g	MR#PRESAH	Often this is the same as the forward data
3	Hourly Average Temperature.	º C	MR#TEMPAH	Often this is the same as the forward data
4	Hourly Average Uncorr-ected Reverse Flow Rate	m^3/ h	MR#VOLFAH	Uncorrected (Actual) volume flow rate
5	Hourly Average Corr-ected Reverse Flow Rate	KSCM/ h	MR#VOLBAH	Corrected (Standard or Base) volume flow rate
6	Hourly Average Mass Reverse Flow Rate	tonne /h	MR#MASSAH	kg/h for Coriolis meters
7	Hourly Average Reverse Energy Rate	GJ/ h	MR#ENGYAH	
8	Hourly Average Reverse Zbase	-	MR#ZEDBAH	Compressibility at reference or base conditions. Same as the forward data
9	Hourly Average Reverse Dbase	kg/ m^3	MR#DENBAH	Gas density at reference or base conditions. Same as the forward data
10	Hourly Average Reverse Zflow	-	MR#ZEDFAH	Compressibility at flowing conditions. Same as the forward data
11	Hourly Average Reverse Dflow	kg/ m^3	MR#DENFAH	Gas density at flowing conditions. Same as the forward data
12	Hourly Average Reverse FPV	-	MR#FPV_AH	Supercompressibility factor. Same as the forward data
13	Hourly Average Reverse Relative Density	-	MR#SPGRAH	Normally data sent to the meter. Same as the forward data
14	Hourly Average Reverse Heating Value	MJ/ m^3	MR#HHVVAH	Normally data sent to the meter. Same as the forward data
15	Hourly "Qbit" Reverse Error Code	-	MR#QCODAH	Code indicating error in primary or secondary device. Same as the forward data
16	Hourly "Qbit" Reverse Error Time	s	MR#QTIMAH	Elapsed time of error during hour. Same as the forward data.

Table 4 Hourly Accumulated Reverse Flow Historical Data Part 2 – Array 14, 24, 34 and 77

Arrays 14, 24, 34 and 77 – Run 1, Run 2, Run 3 and Run 4 hourly average reverse flow data Part 2 respectively.

In the table "#" should be replaced by 1, 2, 3 or 4 as appropriate to the run line.

Column	Item	Units	PI Collect Name	Comments
1	Julian time		HLOG.JULIAN.	Time stamp (Julian time format)
2	Corrected Reverse Volume Hi	M m^3	MR#VOLBNH	Accumulator High non-resetting
3	Corrected Reverse Volume Lo	k m^3	MR#VOLBPH	Accumulator Low –non-resetting
4	Reverse Elapsed Time Hour	s	MR#ELAP_H	Elapsed time that RTU has been operating during hour. Same as the forward data.
5	Reverse Mass Flow High Index	k tonne	MR#MASSNH	Accumulator High non-resetting (kg for Coriolis meters)
6	Reverse Mass Flow Low Index	tonne	MR#MASSPH	Accumulator Low non-resetting (kg for Coriolis meters)
7	Reverse Energy Flow High Index	TJ	MR#ENGYNH	Accumulator High non-resetting each hour
8	Reverse Energy Flow Low Index	GJ	MR#ENGYPH	Accumulator Low non-resetting each hour
9	Reverse Uncorrected Flow High Index	k m^3	MR#VOLFNH	Accumulator High non-resetting each hour
10	Reverse Uncorrected Flow Low Index	m^3	MR#VOLFPH	Accumulator Low non-resetting each hour
11	Corrected Reverse This Hour High	M m^3	MR#VOLBRH	Accumulator High resetting each hour
12	Corrected Reverse This Hour Low	k m^3	MR#VOLBSH	Accumulator Low resetting each hour
13	Mass Reverse Flow This Hour High	k tonne	MR#MASSRH	Accumulator High resetting each hour
14	Mass Reverse Flow This Hour Low	tonne	MR#MASSSH	Accumulator Low resetting each hour
15	Energy Reverse Flow This Hour High	TJ	MR#ENGYRH	Accumulator High resetting each hour
16	Energy Reverse Flow This Hour Low	GJ	MR#ENGYSH	Accumulator Low resetting each hour

~~Table 1~~Table 5 Hourly Average Historical Data – Array 40 Coriolis

Array 40 (AEMO Array Type AT16) Coriolis meters

Column	Item	Units	PI Collect Name	Comments
1	Julian time		HLOG.JULIAN.	Time stamp (Julian time format)
2	Hourly Average Pressure.	kPa g	MFSPRESAH	
3	Hourly Average Temperature	º C	MFSTEMPAH	
4	Hourly Average Uncorrected~~.~~ Flow Rate	m^3/h	MFSVOLFAH	Uncorrected (Actual) volume flow rate
5	Hourly Average Corr~~.~~ected Flow Rate	KSCM/h	MFSVOLBAH	Corrected (Standard or Base) volume flow rate
6	Hourly Average Mass Flow Rate	tonne/h	MFSMASSAH	kg/h for Coriolis meters
7	Hourly Average Energy Rate	GJ/ h	MFSENGYAH	
8	Hourly Average Zbase	-	MFSZEDBAH	Compressibility at reference or base conditions
9	Hourly Average Dbase	kg/m^3	MFSDENBAH	Gas density at reference or base conditions
10	Hourly Average Zflow	-	MFSZEDFAH	Compressibility at flowing conditions
11	Hourly Average Dflow	kg/m^3	MFSDENFAH	Gas density at flowing conditions
12	Hourly Average FPV	-	MFSFPV_AH	Supercompressibility factor (Not normally collected by AEMO
13	Hourly Average Relative Density	-	MFSSPGRAH	Normally data sent to the meter or from attached GC
14	Hourly Average Heating Value	MJ/m^3	MFSHHVVAH	Normally data sent to the meter or from attached GC
15	Daily “Qbit” Error Code	-	MFSQCOD_H	Code indicating error in primary or secondary device
16	Daily “Qbit” Error Time	s	MFSQTIM_H	Elapsed time of error during hour
17	Corrected Volume Hi	M m^3	MFSVOLBNH	Accumulator High non-resetting
18	Corrected Volume Lo	k m^3	MFSVOLBPH	Accumulator Low non-resetting
19	Coriolis measured density	kg/m3	MFSDENCAH	Coriolis measured density
20	Coriolis calculated density	kg/m3	null (or MFSDENLAH)	Not currently implemented (Coriolis calculated (linearised) density)
21	“Top of Hour” Pressure	kPa g	MFSPRES_T	Taken at the end of each hour
22	“Top of Hour” Temperature	º C	MFSTEMP_T	Taken at the end of each hour
23	Elapsed Time Hour	s	MFSELAP_H	Elapsed time that RTU has been operating during hour.
24	Mass Flow Total Hi	k tonne	MFSMASSNH	Accumulator High non-resetting (kg for Coriolis meters)
25	Mass Flow Total Lo	tonne	MFSMASSPH	Accumulator Low non-resetting (kg for Coriolis meters)

Column	Item	Units	PI Collect Name	Comments
26	Energy Total Hi	TJ	MFSENGYNH	Accumulator High non-resetting each hour
27	Energy Total Lo	GJ	MFSENGYPH	Accumulator Low non-resetting each hour
28	Unc~~-C~~orr~~-~~ected Vol Hi	k m3	MFSVOLFNH	Accumulator High non-resetting each hour
29	Unc~~-C~~orr~~-~~ected Vol Lo	m3	MFSVOLFPH	Accumulator Low non-resetting each hour
30	Corrected This Hour High	M m3	MFSVOLBRH	Accumulator High resetting each hour
31	Corrected This Hour Low	k m3	MFSVOLBSH	Accumulator Low resetting each hour
32	Mass Flow This Hour High	k tonne	MFSMASSRH	Accumulator High resetting each hour
33	Mass Flow This Hour Low	tonne	MFSMASSSH	Accumulator Low resetting each hour
34	Energy Flow This Hour High	TJ	MFSENGYRH	Accumulator High resetting each hour
35	Energy Flow This Hour Low	GJ	MFSENGYSH	Accumulator Low resetting each hour
36	Hourly Average Battery Level	Volts	MFSBATTAH	RTU back up battery
37	Hourly Average Gas Level	%LEL	MFSGASLAH (or null)	Gas detector output (where fitted)

~~Table 2~~Table 6 Hourly Average Historical Data – Array 40 Ultrasonic

Array 40 (AEMO Array Type AT18) Ultrasonic meters

Column	Item	Units	PI Collect Name	Comments
1	Julian time		HLOG.JULIAN.	Time stamp (Julian time format)
2	Hourly Average Pressure.	kPa g	MFSPRESAH	
3	Hourly Average Temperature	º C	MFSTEMPAH	
4	Hourly Average Uncorr~~-~~ected Flow Rate	m^3/h	MFSVOLFAH	Uncorrected (Actual) volume flow rate
5	Hourly Average Corr~~-~~ected Flow Rate	KSCM/h	MFSVOLBAH	Corrected (Standard or Base) volume flow rate
6	Hourly Average Mass Flow Rate	tonne/h	MFSMASSAH	kg/h for Coriolis meters
7	Hourly Average Energy Rate	GJ/ h	MFSENGYAH	
8	Hourly Average Zbase	-	MFSZEDBAH	Compressibility at reference or base conditions
9	Hourly Average Dbase	kg/m^3	MFSDENBAH	Gas density at reference or base conditions
10	Hourly Average Zflow	-	MFSZEDFAH	Compressibility at flowing conditions
11	Hourly Average Dflow	kg/m^3	MFSDENFAH	Gas density at flowing conditions
12	Hourly Average FPV	-	MFSFPV_AH	Supercompressibility factor (Not normally collected by AEMO
13	Hourly Average Relative Density	-	MFSSPGRAH	Normally data sent to the meter or from attached GC
14	Hourly Average Heating Value	MJ/m^3	MFSHHVVAH	Normally data sent to the meter or from attached GC
15	Daily “Qbit” Error Code	-	MFSQCOD_H	Code indicating error in primary or secondary device
16	Daily “Qbit” Error Time	s	MFSQTIM_H	Elapsed time of error during hour
17	Corrected Volume Hi	M m^3	MFSVOLBNH	Accumulator High non-resetting
18	Corrected Volume Lo	k m^3	MFSVOLBPH	Accumulator Low non-resetting
19	“Top of Hour” Pressure	kPa G	MFSPRES_T	Taken at the end of each hour
20	“Top of Hour” Temperature	º C	MFSTEMP_T	Taken at the end of each hour
21	Elapsed Time Hour	S	MFSELAP_H	Elapsed time that RTU has been operating during hour.
22	Mass Flow Total Hi	k tonne	MFSMASSNH	Accumulator High non-resetting (kg for Coriolis meters)
23	Mass Flow Total Lo	tonne	MFSMASSPH	Accumulator Low non-resetting (kg for Coriolis meters)
24	Energy Total Hi	TJ	MFSENGYNH	Accumulator High non-resetting each hour
25	Energy Total Lo	GJ	MFSENGYPH	Accumulator Low non-resetting each hour
26	Unc~~-C~~orr~~-~~ected Vol Hi	k m3	MFSVOLFNH	Accumulator High non-resetting
27	Unc~~-C~~orr~~-~~ected Vol Lo	m3	MFSVOLFPH	Accumulator Low non-resetting

Column	Item	Units	PI Collect Name	Comments
28	Corrected This Hour High	M m3	MFSVOLBRH	Accumulator High resetting each hour
29	Corrected This Hour Low	k m3	MFSVOLBSH	Accumulator Low resetting each hour
30	Mass Flow This Hour High	k tonne	MFSMASSRH	Accumulator High resetting each hour
31	Mass Flow This Hour Low	tonne	MFSMASSSH	Accumulator Low resetting each hour
32	Energy Flow This Hour High	TJ	MFSENGYRH	Accumulator High resetting each hour
33	Energy Flow This Hour Low	GJ	MFSENGYSH	Accumulator Low resetting each hour
34	Hourly Average Battery Level	VOLTS	MFSBATTAH	RTU back up battery
35	Hourly Average Gas Level	%LEL	MFSGASLAH OR NULL	Gas detector output (where fitted)
36	Hourly Average Velocity of Sound	m/s	MFSVELSAH	Only Ultrasonic meters

~~Table 3~~Table 7 Hourly Average Historical Data – Array 40 Turbine

Array 40 (AEMO Array Type AT19) Turbine meters

Column	Item	Units	PI Collect Name	Comments
1	Julian time		HLOG.JULIAN.	Time stamp (Julian time format)
2	Hourly Average Pressure.	kPa G	MFSPRESAH	
3	Hourly Average Temperature	º C	MFSTEMPAH	
4	Hourly Average Uncorr~~.~~ected Flow Rate	m^3/h	MFSVOLFAH	Uncorrected (Actual) volume flow rate
5	Hourly Average Corr. Flow Rate	KSCM/h	MFSVOLBAH	Corrected (Standard or Base) volume flow rate
6	Hourly Average Mass Flow Rate	tonne/h	MFSMASSAH	kg/h for Coriolis meters
7	Hourly Average Energy Rate	GJ/ h	MFSENGYAH	
8	Hourly Average Zbase	-	MFSZEDBAH	Compressibility at reference or base conditions
9	Hourly Average Dbase	kg/ m^3	MFSDENBAH	Gas density at reference or base conditions
10	Hourly Average Zflow	-	MFSZEDFAH	Compressibility at flowing conditions
11	Hourly Average Dflow	kg/ m^3	MFSDENFAH	Gas density at flowing conditions
12	Hourly Average FPV	-	MFSFPV_AH	Supercompressibility factor (Not normally collected by AEMO
13	Hourly Average Relative Density	-	MFSSPGRAH	Normally data sent to the meter or from attached GC
14	Hourly Average Heating Value	MJ/ m^3	MFSHHVVAH	Normally data sent to the meter or from attached GC
15	Daily “Qbit” Error Code	-	MFSQCOD_H	Code indicating error in primary or secondary device
16	Daily “Qbit” Error Time	s	MFSQTIM_H	Elapsed time of error during hour
17	Corrected Volume Hi	M m^3	MFSVOLBNH	Accumulator High non-resetting
18	Corrected Volume Lo	k m^3	MFSVOLBPH	Accumulator Low non-resetting
19	“Top of Hour” Pressure	kPa g	MFSPRES_T	Taken at the end of each hour
20	“Top of Hour” Temperature	º C	MFSTEMP_T	Taken at the end of each hour
21	Elapsed Time Hour	S	MFSELAP_H	Elapsed time that RTU has been operating during hour.
22	Mass Flow Total Hi	k tonne	MFSMASSNH	Accumulator High non-resetting (kg for Coriolis meters)
23	Mass Flow Total Lo	tonne	MFSMASSPH	Accumulator Low non-resetting (kg for Coriolis meters)
24	Energy Total Hi	TJ	MFSENGYNH	Accumulator High non-resetting each hour
25	Energy Total Lo	GJ	MFSENGYPH	Accumulator Low non-resetting each hour
26	Unc~~-C~~orr~~.~~ected Vol Hi	k m3	MFSVOLFNH	Accumulator High non-resetting
27	Unc~~-C~~orr~~.~~ected Vol Lo	m3	MFSVOLFPH	Accumulator Low non-resetting

Column	Item	Units	PI Collect Name	Comments
28	Corrected This Hour High	M m3	MFSVOLBRH	Accumulator High resetting each hour
29	Corrected This Hour Low	k m3	MFSVOLBSH	Accumulator Low resetting each hour
30	Mass Flow This Hour High	k tonne	MFSMASSRH	Accumulator High resetting each hour
31	Mass Flow This Hour Low	tonne	MFSMASSSH	Accumulator Low resetting each hour
32	Energy Flow This Hour High	TJ	MFSENGYRH	Accumulator High resetting each hour
33	Energy Flow This Hour Low	GJ	MFSENGYSH	Accumulator Low resetting each hour
34	Hourly Average Battery Level	VOLTS	MFSBATTAH	RTU back up battery
35	Hourly Average Gas Level	%LEL	MFSGASLAH (OR NULL)	Gas detector output (where fitted)

~~Table 4~~Table 8 Hourly Average Reverse Flow Historical Data – Array 41 Ultrasonic

Array 41 (AEMO Array Type AT23) Ultrasonic meters

Column	Item	Units	PI Collect Name	Comments
1	Julian time		HLOG.JULIAN.	Time stamp (Julian time format)
2	Hourly Average Pressure	kPa g	MRSPRESAH	Often this is the same as the forward data
3	Hourly Average Temperature.	º C	MRSTEMPAH	Often this is the same as the forward data
4	Hourly Average Uncorr~~.~~ected Reverse Flow Rate	m^3/ h	MRSVOLFAH	Uncorrected (Actual) volume flow rate
5	Hourly Average Corrected~~.~~ Reverse Flow Rate	KSCM/h	MRSVOLBAH	Corrected (Standard or Base) volume flow rate
6	Hourly Average Mass Reverse Flow Rate	tonne/h	MRSMASSAH	kg/h for Coriolis meters
7	Hourly Average Reverse Energy Rate	GJ/ h	MRSENGYAH	
8	Hourly Average Reverse Zbase	-	MRSZEDBAH	Compressibility at reference or base conditions. Same as the forward data
9	Hourly Average Reverse Dbase	kg/ m^3	MRSDENBAH	Gas density at reference or base conditions. Same as the forward data
10	Hourly Average Reverse Zflow	-	MRSZEDFAH	Compressibility at flowing conditions. Same as the forward data
11	Hourly Average Reverse Dflow	kg/ m^3	MRSDENFAH	Gas density at flowing conditions. Same as the forward data
12	Hourly Average Reverse FPV	-	MRSFPV_AH	Supercompressibility factor. Same as the forward data
13	Hourly Average Reverse Relative Density	-	MRSSPGRAH	Normally data sent to the meter. Same as the forward data
14	Hourly Average Reverse Heating Value	MJ/ m^3	MRSHHVVAH	Normally data sent to the meter. Same as the forward data
15	Hourly “Qbit” Reverse Error Code	-	MRSQCODAH	Code indicating error in primary or secondary device. Same as the forward data
16	Hourly “Qbit” Reverse Error Time	s	MRSQTIMAH	Elapsed time of error during hour. Same as the forward data.
17	Corrected Reverse Volume Hi	M m3	MRSVOLBNH	Accumulator High non-resetting
18	Corrected Reverse Volume Lo	k m3	MRSVOLBPH	Accumulator Low non-resetting
19	Reverse Elapsed Time Hour	s	MRSELAP_H	Elapsed time that RTU has been operating during hour. Same as the forward data.
20	Reverse Mass Flow High Index	k tonne	MRSMASSNH	Accumulator High non-resetting (kg for Coriolis meters)
21	Reverse Mass Flow Low Index	tonne	MRSMASSPH	Accumulator Low non-resetting (kg for Coriolis meters)
22	Reverse Energy Flow High Index	TJ	MRSENGYNH	Accumulator High non-resetting each hour
23	Reverse Energy Flow Low Index	GJ	MRSENGYPH	Accumulator Low non-resetting each hour

Column	Item	Units	PI Collect Name	Comments
24	Reverse Uncorrected Flow High Index	k m3	MRSVOLFNH	Accumulator High non-resetting each hour
25	Reverse Uncorrected Flow Low Index	m3	MRSVOLFPH	Accumulator Low non-resetting each hour
26	Corrected Reverse This Hour High	M m3	MRSVOLBRH	Accumulator High resetting each hour
27	Corrected Reverse This Hour Low	k m3	MRSVOLBSH	Accumulator Low resetting each hour
28	Mass Reverse Flow This Hour High	k tonne	MRSMASSRH	Accumulator High resetting each hour
29	Mass Reverse Flow This Hour Low	tonne	MRSMASSSH	Accumulator Low resetting each hour
30	Energy Reverse Flow This Hour High	TJ	MRSENGYRH	Accumulator High resetting each hour
31	Energy Reverse Flow This Hour Low	GJ	MRSENGYSH	Accumulator Low resetting each hour

~~Table 5~~Table 9 Hourly Average Historical Data Part 1 – Array 47 Coriolis

Array 47 (AEMO Array Type AT83) Coriolis meters ~~(Equivalent array for ultrasonic meters)~~

Column	Item	Units	PI Collect Name	Comments
1	Julian time		HLOG.JULIAN.	Time stamp (Julian time format)
2	Hourly Average Pressure.	kPa g	MFSPRESAH	
3	Hourly Average Temperature	º C	MFSTEMPAH	
4	Hourly Average Uncorr~~.~~ected Flow Rate	m^3/H	MFSVOLFAH	Uncorrected (Actual) volume flow rate
5	Hourly Average Corrected~~.~~ Flow Rate	KSCM/ h	MFSVOLBAH	Corrected (Standard or Base) volume flow rate
6	Hourly Average Mass Flow Rate	tonne/ h	MFSMASSAH	kg/h for Coriolis meters
7	Hourly Average Energy Rate	GJ/ h	MFSENGYAH	
8	Hourly Average Zbase	-	MFSZEDBAH	Compressibility at reference or base conditions
9	Hourly Average Dbase	kg/ m^3	MFSDENBAH	Gas density at reference or base conditions
10	Hourly Average Zflow	-	MFSZEDFAH	Compressibility at flowing conditions
11	Hourly Average Dflow	kg/ m^3	MFSDENFAH	Gas density at flowing conditions
12	Hourly Average Relative Density	-	MFSSPGRAH	Normally data sent to the meter or from attached GC
13	Hourly Average Heating Value	MJ/ m^3	MFSHHVVAH	Normally data sent to the meter or from attached GC
14	Daily “Qbit” Error Code	-	MFSQCOD_H	Code indicating error in primary or secondary device
15	Daily “Qbit” Error Time	s	MFSQTIM_H	Elapsed time of error during hour
16	Coriolis measured density	kg/ m^3	MFSDENCAH	Coriolis measured density
17	Coriolis calculated density	kg/ m^3	NULL (OR MFSDENLAH)	Not currently implemented. (Coriolis calculated (linearised) density)
18	Hourly Average Battery Level	VOLTS	MFSBATTAH	RTU back up battery
19	Hourly Average Gas Level	%LEL	MFSGASLAH (OR NULL)	Gas detector output (where fitted)

~~Table 6~~Table 10 Hourly Average Historical Data Part 1 – Array 47 Turbine and Ultrasonic

Array 47 (AEMO Array Type AT83) Turbine and Ultrasonic meters ~~(Equivalent array for ultrasonic meters)~~

Column	Item	Units	PI Collect Name	Comments
1	Julian time		HLOG.JULIAN.	Time stamp (Julian time format)
2	Hourly Average Pressure.	kPa g	MFSPRESAH	
3	Hourly Average Temperature	º C	MFSTEMPAH	
4	Hourly Average Uncorrected ~~Uncorr.~~ Flow Rate	m^3/ h	MFSVOLFAH	Uncorrected (Actual) volume flow rate
5	Hourly Average Corr~~.~~ected Flow Rate	KSCM/ h	MFSVOLBAH	Corrected (Standard or Base) volume flow rate
6	Hourly Average Mass Flow Rate	tonne/ h	MFSMASSAH	kg/h for Coriolis meters
7	Hourly Average Energy Rate	GJ/ h	MFSENGYAH	
8	Hourly Average Zbase	-	MFSZEDBAH	Compressibility at reference or base conditions
9	Hourly Average Dbase	kg/ m^3	MFSDENBAH	Gas density at reference or base conditions
10	Hourly Average Zflow	-	MFSZEDFAH	Compressibility at flowing conditions
11	Hourly Average Dflow	kg/ m^3	MFSDENFAH	Gas density at flowing conditions
12	Hourly Average Relative Density	-	MFSSPGRAH	Normally data sent to the meter or from attached GC
13	Hourly Average Heating Value	MJ/ m^3	MFSHHVVAH	Normally data sent to the meter or from attached GC
14	Daily “Qbit” Error Code	-	MFSQCOD_H	Code indicating error in primary or secondary device
15	Daily “Qbit” Error Time	s	MFSQTIM_H	Elapsed time of error during hour
16	Supercompressibility factor (FPV)	-	MFSFPV_AH	Supercompressibility factor
17	Hourly Average Meter VOS	m/s	MFSVELSAH	Velocity of sound
18	Hourly Average Battery Level	VOLTS	MFSBATTAH	RTU back up battery
19	Hourly Average Gas Level	%LEL	MFSGASLAH (OR NULL)	Gas detector output (where fitted)

~~Table 7~~Table 11 Hourly Accumulated Historical Data Part 2 – Array 48

Array 48 (AEMO Array Type AT87) Coriolis, Turbine and Ultrasonic meters

Column	Item	Units	PI Collect Name	Comments
1	Julian time		HLOG.JULIAN.	Time stamp (Julian time format)
2	Corrected Volume Hi	M m^3	MFSVOLBNH	Accumulator High non-resetting
3	Corrected Volume Lo	k m^3	MFSVOLBPH	Accumulator Low non-resetting
4	"Top of Hour" Pressure	kPa g	MFSPRES_T	Taken at the end of each hour
5	"Top of Hour" Temperature	º C	MFSTEMP_T	Taken at the end of each hour
6	Elapsed Time Hour	s	MFSELAP_H	Elapsed time that RTU has been operating during hour.
7	Mass Flow Total Hi	k tonne	MFSMASSNH	Accumulator High non-resetting (kg for Coriolis meters)
8	Mass Flow Total Lo	tonne	MFSMASSPH	Accumulator Low non-resetting (kg for Coriolis meters)
9	Energy Total Hi	TJ	MFSENGYNH	Accumulator High non-resetting each hour
10	Energy Total Lo	GJ	MFSENGYPH	Accumulator Low non-resetting each hour
11	Uncorrected ~~Uncorr.~~ Vol Hi	k m^3	MFSVOLFNH	Accumulator High non-resetting each hour
12	Uncorrected ~~Uncorr.~~ Vol Lo	m^3	MFSVOLFPH	Accumulator Low non-resetting each hour
13	Corrected This Hour High	M m^3	MFSVOLBRH	Accumulator High resetting each hour
14	Corrected This Hour Low	k m^3	MFSVOLBSH	Accumulator Low resetting each hour
15	Mass Flow This Hour High	k tonne	MFSMASSRH	Accumulator High resetting each hour
16	Mass Flow This Hour Low	tonne	MFSMASSSH	Accumulator Low resetting each hour
17	Energy Flow This Hour High	TJ	MFSENGYRH	Accumulator High resetting each hour
18	Energy Flow This Hour Low	GJ	MFSENGYSH	Accumulator Low resetting each hour

~~Table 8~~Table 12 Daily Average Historical Data – Array 50

Array 50 (AEMO array Type AT35) Ultrasonic, Turbine and Coriolis meters

Column	Item	Units	PI Collect Name	Comments
1	Julian time		DLOG.JULIAN.	Time stamp (Julian time format)
2	Daily Average Pressure	kPa g	MFSPRESAD	
3	Daily Average Temperature	º C	MFSTEMPAD	
4	Daily Average Uncorrected ~~Uncorr.~~ Flow Rate	m^3/ h	MFSVOLFAD	Uncorrected (Actual) volume flow rate
5	Daily Average Corr~~.~~ected Flow Rate	KSCM/ h	MFSVOLBAD	Corrected (Standard or Base) volume flow rate
6	Daily Average Mass Flow Rate	tonne/ h	MFSMASSAD	kg/h for Coriolis meters
7	Daily Average Energy Rate	GJ/ h	MFSENGYAD	
8	Daily Average Zbase	-	MFSZEDBAD	Compressibility at reference or base conditions
9	Daily Average Dbase	kg/ m^3	MFSDENBAD	Gas density at reference or base conditions
10	Daily Average Zflow	-	MFSZEDFAD	Compressibility at flowing conditions
11	Daily Average Dflow	kg/ m^3	MFSDENFAD	Gas density at flowing conditions
12	Daily Average FPV	-	MFSFPV_AD	Supercompressibility factor
13	Daily ~~Un-Corrected~~Uncorrected Volume Hi	M m^3	MFSVOLFND	Accumulator High non-resetting same as hourly 6:00am
14	Daily ~~Un-Corrected~~Uncorrected Volume Lo	k m^3	MFSVOLFPD	Accumulator Low non-resetting same as hourly 6:00am
15	Daily Corrected Volume Hi	M m^3	MFSVOLBND	Accumulator High non-resetting same as hourly 6:00am
16	Daily Corrected Volume Lo	k m^3	MFSVOLBPD	Accumulator Low non-resetting same as hourly 6:00am
17	Daily Corrected Mass Hi	k tonne	MFSMASSND	Accumulator High non-resetting (kg for Coriolis meters) same as hourly 6:00am
18	Daily Corrected Mass Lo	tonne	MFSMASSPD	Accumulator Low non-resetting (kg for Coriolis meters) same as hourly 6:00am
19	Daily Corrected Energy Hi	TJ	MFSENGYND	Accumulator High non-resetting same as hourly 6:00am
20	Daily Corrected Energy Lo	GJ	MFSENGYPD	Accumulator Low non-resetting same as hourly 6:00am
21	Daily Average Capacity	%	MFSCPTYAD	Daily average capacity
22	Daily Maximum Capacity	%	MFSCPTYMD	Maximum daily instantaneous flow rate.
23	Daily Average Relative Density	-	MFSSPRGAD	
24	Daily Average Heating Value	MJ/ m3	MFSHHVVAD	
25	Daily “Qbit” Error Code	-	MFSQCOD_D	Code indicating error in primary or secondary device
26	Daily “Qbit” Error Time	s	MFSQTIM_D	Elapsed time of error during day

27	Elapsed Time Day	min	MFSELAP_D	Elapsed time that RTU has been operating during day.

~~Table 11~~Table 13 Daily Average Reverse Flow Historical Data – Array 51

Array 51 (AEMO array Type AT38) Ultrasonic meters

Column	Item	Units	PI Collect Name	Comments
1	Julian time		DLOG.JULIAN.	Time stamp (Julian time format)
2	Daily Average Pressure	kPa g	MRSPRESAD	Often this is the same as the forward data
3	Daily Average Temperature	º C	MRSTEMPAD	Often this is the same as the forward data
4	Daily Average Uncorrected ~~Uncorr.~~ Reverse Flow Rate	m^3/ h	MRSVOLFAD	Uncorrected (Actual) volume flow rate
5	Daily Average Corr~~.~~ected Reverse Flow Rate	KSCM/ h	MRSVOLBAD	Corrected (Standard or Base) volume flow rate
6	Daily Average Mass Reverse Flow Rate	tonne/ h	MRSMASSAD	kg/h for Coriolis meters
7	Daily Average Energy Reverse Rate	GJ/ h	MRSENGYAD	
8	Daily Average Reverse Zbase	-	MRSZEDBAD	Compressibility at reference or base conditions. Same as the forward data
9	Daily Average Reverse Dbase	kg/ m^3	MRSDENBAD	Gas density at reference or base conditions. Same as the forward data
10	Daily Average Reverse Zflow	-	MRSZEDFAD	Compressibility at flowing conditions
11	Daily Average Reverse Dflow	kg/ m^3	MRSDENFAD	Gas density at flowing conditions
12	Daily Average Reverse FPV	-	MRSFPV_AD	Supercompressibility factor
13	Daily ~~Un-Corrected~~Uncorrected Reverse Volume Hi	M m^3	MRSVOLFND	Accumulator High non-resetting same as hourly 6:00am
14	Daily ~~Un-Corrected~~Uncorrected Reverse Volume Lo	k m^3	MRSVOLFPD	Accumulator Low non-resetting same as hourly 6:00am
15	Daily Corrected Reverse Volume Hi	M m^3	MRSVOLBND	Accumulator High non-resetting same as hourly 6:00am
16	Daily Corrected Reverse Volume Lo	k m^3	MRSVOLBPD	Accumulator Low non-resetting same as hourly 6:00am
17	Daily Corrected Reverse Mass Hi	k tonne	MRSMASSND	Accumulator High non-resetting (kg for Coriolis meters) same as hourly 6:00am
18	Daily Corrected Reverse Mass Lo	tonne	MRSMASSPD	Accumulator Low non-resetting (kg for Coriolis meters) same as hourly 6:00am
19	Daily Corrected Reverse Energy Hi	TJ	MRSENGYND	Accumulator High non-resetting same as hourly 6:00am
20	Daily Corrected Reverse Energy Lo	GJ	MRSENGYPD	Accumulator Low non-resetting same as hourly 6:00am
21	Daily Average Reverse Capacity	%	MRSCPTYAD	Average instantaneous reverse flow rate.
22	Daily Maximum Reverse Capacity	%	MRSCPTYMD	Maximum instantaneous reverse flow rate.

Column	Item	Units	PI Collect Name	Comments
23	Daily Average Reverse Relative Density	-	MRSSPGERAD	Same as the forward data
24	Daily Average Reverse Heating Value	MJ/ m3	MRSHHVVAD	Same as the forward data
25	Daily “Qbit” Reverse Error Code	-	MRSQCOD_D	Code indicating error in primary or secondary device
26	Daily “Qbit” Reverse Error Time	s	MRSQTIM_D	Elapsed time of error during day
27	Elapsed Time Day	min	MRSELAP_H	Elapsed time that RTU has been operating during day. same as forward

Table 14 Hourly Average Reverse Flow Historical Data Part 1 – Array 67

Array 67 (AEMO Array Type AT88) Ultrasonic meters

Column	Item	Units	PI Collect Name	Comments
1	Julian time		HLOG.JULIAN.	Time stamp (Julian time format)
2	Hourly Average Pressure	kPa g	MRSPRESAH	Often this is the same as the forward data
3	Hourly Average Temperature.	º C	MRSTEMPAH	Often this is the same as the forward data
4	Hourly Average Uncorrected ~~Uncorr.~~ Reverse Flow Rate	m^3/ h	MRSVOLFAH	Uncorrected (Actual) volume flow rate
5	Hourly Average Corr~~.~~ected Reverse Flow Rate	KSCM/ h	MRSVOLBAH	Corrected (Standard or Base) volume flow rate
6	Hourly Average Mass Reverse Flow Rate	tonne /h	MRSMASSAH	kg/h for Coriolis meters
7	Hourly Average Reverse Energy Rate	GJ/ h	MRSENGYAH	
8	Hourly Average Reverse Zbase	-	MRSZEDBAH	Compressibility at reference or base conditions. Same as the forward data
9	Hourly Average Reverse Dbase	kg/ m^3	MRSDENBAH	Gas density at reference or base conditions. Same as the forward data
10	Hourly Average Reverse Zflow	-	MRSZEDFAH	Compressibility at flowing conditions. Same as the forward data
11	Hourly Average Reverse Dflow	kg/ m^3	MRSDENFAH	Gas density at flowing conditions. Same as the forward data
12	Hourly Average Reverse FPV	-	MRSFPV_AH	Supercompressibility factor. Same as the forward data
13	Hourly Average Reverse Relative Density	-	MRSSPGRAH	Normally data sent to the meter. Same as the forward data
14	Hourly Average Reverse Heating Value	MJ/ m^3	MRSHHVVAH	Normally data sent to the meter. Same as the forward data
15	Hourly “Qbit” Reverse Error Code	-	MRSQCODAH	Code indicating error in primary or secondary device. Same as forward data
16	Hourly “Qbit” Reverse Error Time	s	MRSQTIMAH	Elapsed time of error during hour. Same as the forward data.

Table 15 Hourly Accumulated Reverse Flow Historical Data Part 2 – Array 68

Array 68 (AEMO Array Type AT89) Ultrasonic meters

Column	Item	Units	PI Collect Name	Comments
1	Julian time		HLOG.JULIAN.	Time stamp (Julian time format)
2	Corrected Reverse Volume Hi	M m^3	MRSVOLBNH	Accumulator High non-resetting
3	Corrected Reverse Volume Lo	k m^3	MRSVOLBPH	Accumulator Low –non-resetting
4	Reverse Elapsed Time Hour	s	MRSELAP_H	Elapsed time that RTU has been operating during hour. Same as the forward data.
5	Reverse Mass Flow High Index	k tonne	MRSMASSNH	Accumulator High non-resetting (kg for Coriolis meters)
6	Reverse Mass Flow Low Index	tonne	MRSMASSPH	Accumulator Low non-resetting (kg for Coriolis meters)
7	Reverse Energy Flow High Index	TJ	MRSENGYNH	Accumulator High non-resetting each hour
8	Reverse Energy Flow Low Index	GJ	MRSENGYPH	Accumulator Low non-resetting each hour
9	Reverse Uncorrected Flow High Index	k m^3	MRSVOLFNH	Accumulator High non-resetting each hour
10	Reverse Uncorrected Flow Low Index	m^3	MRSVOLFPH	Accumulator Low non-resetting each hour
11	Corrected Reverse This Hour High	M m^3	MRSVOLBRH	Accumulator High resetting each hour
12	Corrected Reverse This Hour Low	k m^3	MRSVOLBSH	Accumulator Low resetting each hour
13	Mass Reverse Flow This Hour High	k tonne	MRSMASSRH	Accumulator High resetting each hour
14	Mass Reverse Flow This Hour Low	tonne	MRSMASSSH	Accumulator Low resetting each hour
15	Energy Reverse Flow This Hour High	TJ	MRSENGYRH	Accumulator High resetting each hour
16	Energy Reverse Flow This Hour Low	GJ	MRSENGYSH	Accumulator Low resetting each hour

~~6.5~~2.5 Multi-run and orifice metering installations

- At CTM installations where the metering is performed by two or more meters, the data listed above where relevant, should be provided for each individual meter. The same data, where relevant, should be provided for the "station total". ~~Examples of multi-run array types are available from AEMO.~~
- The above tables refer primarily to positive displacement, turbine, Coriolis and ultrasonic meters. If orifice meters are used, the average differential pressures for each of the metering runs are also to be provided. Examples of differential-pressure array types are available from AEMO.
- New array types are developed as the need arises. Where circumstances dictate that other arrays should be used, AEMO should be consulted to choose the most appropriate array configuration.

~~6.6 Diagnostic Data to be available to AEMO~~

~~The following data to be made available from metering sites is used for the detection of abnormal meter or system operation.~~

~~Table 6 Daily Pressure Drop & Capacity.~~

~~Array 57~~

~~Item~~	~~Units~~	~~Comments~~
~~Time~~		~~Time stamp of "Rate of Pressure drop – minute"~~
~~Rate of Pressure drop - Minute~~	~~KPA/MIN~~	~~Maximum rate of pressure drop.~~
~~Time~~		~~Time stamp of "Maximum rate of Pressure Drop – Day"~~
~~Maximum rate of Pressure Drop - Day~~	~~KPA/MIN~~	~~Maximum rate of pressure drop during day.~~
~~Time~~		~~Time stamp of "Maximum Daily Capacity".~~
~~Maximum Daily Capacity~~	~~%~~	~~Maximum meter flow rate during day~~
~~Time~~		~~Time stamp of "Maximum Daily Reverse Capacity".(where relevant)~~
~~Maximum Daily Reverse Capacity~~	~~%~~	~~Maximum meter reverse flow rate during day (where relevant).~~

~~6.4~~2.6 Gas chromatograph data to be available to AEMO

Where a CTM has an associated gas chromatograph the gas composition and other data as specified below is to be made available to AEMO for downloading gas composition data to remote CTMs as required.

~~Table 12~~Table 16 Hourly Average Historical Data – Array 81, 82 and 83

Arrays 81, 82 and 83 (AEMO Array Type AT54, AT58 and AT60 respectively) C6 gas chromatograph - sample lines 1, 2 and 3 respectively

In the table "#" should be replaced by 1, 2 or 3 as appropriate to the sample line.

Column	Item	Units	PI Collect Name	Comments
1	Julian time		HLOG.JULIAN.	Time stamp (Julian time format)
2	Hourly Ave Hexane+	MOLE %	C6#C6PLAH	Hexane (C6) plus higher hydrocarbons

3	Hourly Ave Propane	MOLE %	C6#C3__AH	Propane (C3)
4	Hourly Ave Butane_Iso	MOLE %	C6#C4I_AH	Iso Butane (C4I)
5	Hourly Ave Butane_N	MOLE %	C6#C4NLAH	Normal Butane (C4N)
6	Hourly Ave Pentane_Neo	MOLE %	C6#C5NEAH	Neo-Pentane (C5Neo)
7	Hourly Ave Pentane_Iso	MOLE %	C6#C5I_AH	Iso-Pentane (C5I)
8	Hourly Ave Pentane_N	MOLE %	C6#C5NLAH	Normal Pentane (C5N)
9	Hourly Ave Nitrogen	MOLE %	C6#N2__AH	Nitrogen (N2)
10	Hourly Ave Methane	MOLE %	C6#C1__AH	Methane (C1)
11	Hourly Ave Carbon Dioxide	MOLE %	C6#CO2_AH	Carbon Dioxide (CO2)
12	Hourly Ave Ethane	MOLE %	C6#C2__AH	Ethane (C2)
13	Hourly Ave Mole% Total	MOLE %	C6#TOTLAH	The un-normalised mole %
14	Hourly Average Relative Density	-	C6#SPGRAH	
15	Hourly Ave HHV Volume	MJ/ m^3	C6#HHVVAH	
16	Hourly Ave Wobbe Index	MJ/ m^3	C6#WOBBAH	

~~Table 13~~Table 17 Hourly Average Historical Data – Array 91 and 92

Arrays 91 and 92 (AEMO Array Type AT67 and AT70 respectively) C9 gas chromatograph - sample lines 1 and 2 respectively

In the table "#" should be replaced by 1 or 2 as appropriate to the sample line.

Column	Item	Units	PI Collect Name	Comments
1	Julian time		HLOG.JULIAN.	Time stamp (Julian time format)
2	Hourly Ave Hexane+	MOLE %	C9#C6PLAH	Hexane (C6) plus higher hydrocarbons
3	Hourly Ave Propane	MOLE %	C9#C3__AH	Propane (C3)
4	Hourly Ave Butane_Iso	MOLE %	C9#C4I_AH	Iso Butane (C4I)
5	Hourly Ave Butane_N	MOLE %	C9#C4NLAH	Normal Butane (C4N)
6	Hourly Ave Pentane_Neo	MOLE %	C9#C5NEAH	Neo-Pentane (C5Neo)
7	Hourly Ave Pentane_Iso	MOLE %	C9#C5I_AH	Iso-Pentane (C5I)
8	Hourly Ave Pentane_N	MOLE %	C9#C5NLAH	Normal Pentane (C5N)
9	Hourly Ave Nitrogen	MOLE %	C9#N2__AH	Nitrogen (N2)
10	Hourly Ave Methane	MOLE %	C9#C1__AH	Methane (C1)
#11	Hourly Ave Carbon Dioxide	MOLE %	C9#CO2_AH	Carbon Dioxide (CO2)
12	Hourly Ave Ethane	MOLE %	C9#C2__AH	Ethane (C2)

13	Hourly Ave Mole% Total	MOLE %	C9#TOTLAH	The un-normalised mole %
14	Hourly Average Relative Density	-	C9#SPGRAH	
15	Hourly Ave HHV Volume	MJ/ m^3	C9#HHVVAH	
16	Hourly Ave Wobbe Index	MJ/ m^3	C9#WOBBAH	
17	Hourly Ave Nonane+	MOLE %	C9#C9PLAH	Nonane (C9) plus higher hydrocarbons
18	Hourly Ave Hexane	MOLE %	C9#C6__AH	Hexane (C6)
19	Hourly Ave Heptane	MOLE %	C9#C7__AH	Heptane (C7)
20	Hourly Ave Octane	MOLE %	C9#C8__AH	Octane (C8)
21	Hydrocarbon dewpoint @ 2800	º C	C9#HC28AH	
22	Hydrocarbon dewpoint @ 3500	º C	C9#HC35AH	Hydrocarbon dewpoint @ 3500 (Official Hydrocarbon Dewpoint)
23	Hydrocarbon dewpoint @ 6000	º C	C9#HC60AH	
24	Hydrocarbon dewpoint @ 8000	º C	C9#HC80AH	
25	Elapsed Time Hour	s	MFSELAP_H	Elapsed time that RTU has been operating during hour.

Table 18 Hourly Average Historical Data Part 1 – Array 95 and 98

Arrays 95 and 98 (AEMO Array Type AT121 and AT92 respectively) C9 gas chromatograph - sample lines 1 and 2 respectively

In the table "#" should be replaced by 1 or 2 as appropriate to the sample line.

Column	Item	Units	PI Collect Name	Comments
1	Julian time		HLOG.JULIAN.	Time stamp (Julian time format)
2	Hourly Ave Hexane+	MOLE %	C9#C6PLAH	Hexane (C6) plus higher hydrocarbons
3	Hourly Ave Propane	MOLE %	C9#C3__AH	Propane (C3)
4	Hourly Ave Butane_Iso	MOLE %	C9#C4I_AH	Iso Butane (C4I)
5	Hourly Ave Butane_N	MOLE %	C9#C4NLAH	Normal Butane (C4N)
6	Hourly Ave Pentane_Neo	MOLE %	C9#C5NEAH	Neo-Pentane (C5Neo)
7	Hourly Ave Pentane_Iso	MOLE %	C9#C5I_AH	Iso-Pentane (C5I)
8	Hourly Ave Pentane_N	MOLE %	C9#C5NLAH	Normal Pentane (C5N)
9	Hourly Ave Nitrogen	MOLE %	C9#N2__AH	Nitrogen (N2)
10	Hourly Ave Methane	MOLE %	C9#C1__AH	Methane (C1)
11	Hourly Ave Carbon Dioxide	MOLE %	C9#CO2_AH	Carbon Dioxide (CO2)
12	Hourly Ave Ethane	MOLE %	C9#C2__AH	Ethane (C2)
13	Hourly Ave Mole% Total	MOLE %	C9#TOTLAH	The un-normalised mole %
14	Hourly Average Relative Density	-	C9#SPGRAH	
15	Hourly Ave_HHV Volume	MJ/ m^3	C9#HHVVAH	
16	Hourly Ave_Wobbe Index	MJ/ m^3	C9#WOBBAH	

Table 19 Hourly Average Historical Data Part 2 – Array 96 and 99

Arrays 96 and 99 (AEMO Array Type AT122 and AT93 respectively) C9 gas chromatograph - sample lines 1 and 2 respectively

In the table "#" should be replaced by 1 or 2 as appropriate to the sample line.

Column	Item	Units	PI Collect Name	Comments
1	Julian time		HLOG.JULIAN.	Time stamp (Julian time format)
2	Hourly Ave Nonane+	MOLE %	C9#C9PLAH	Nonane (C9) plus higher hydrocarbons
3	Hourly Ave Hexane	MOLE %	C9#C6__AH	Hexane (C6)
4	Hourly Ave Heptane	MOLE %	C9#C7__AH	Heptane (C7)
5	Hourly Ave Octane	MOLE %	C9#C8__AH	Octane (C8)
6	Hydrocarbon dewpoint @ 2800	º C	C9#HC28AH	
7	Hydrocarbon dewpoint @ 3500	º C	C9#HC35AH	Hydrocarbon dewpoint @ 3500 (Official Hydrocarbon Dewpoint)
8	Hydrocarbon dewpoint @ 4200	º C	C9#HC42AH	
9	Hydrocarbon dewpoint @ 6000	º C	C9#HC60AH	

~~6.47~~2.7 Real-time instantaneous readings by AEMO

For transmission system operation and monitoring, and to assist with fault identification and rectification, AEMO needs to be able to obtain "current readings" from metering RTUs.

T~~he t~~ransmission system operation and monitoring requirements vary with meter location and role. AEMO should be consulted ~~as to what the~~about individual requirements ~~will be~~ for a particular site.

The minimum data required from a metering site as "real-time instantaneous readings" are listed in the table below.

~~Table 14~~Table 20 Metering Real-Time Data

In the table "xxxx" should be replaced by appropriate CTM name. For example

Data	PI Collect Name Extension	Comments
RTU in calibration Mode	.RTU.CTM.CALM	Digital "alarm" flag
Mains Voltage	.SITE.MAINS.FLT	Digital "alarm" flag (not required at solar powered sites
Battery Voltage	.BATT.RTU.VOLT	RTU supply battery (Volts)
I/O Card Fault	.RTU.xxxx.IOCF	Digital "alarm" flag
Door Switch Security	.SITE.SECURITY.DORA	Digital "alarm" flag - RTU door
Site Maintenance Alarm	.SITE.GENRL_INSTRU.MNTA	Digital "alarm" flag - system fault
Pit Lid Switch	.SITE.PIT.LIDA	Digital "alarm" flag
Pit Water Level	.SITE.PIT.WLHI	Digital "alarm" flag
Gas Pressure	.PIPE.CTM.GP	At meter (kPa)
Gas Temperature	.PIPE.CTM.GT	At meter (º C)
Energy Flow Rate	.PIPE.CTM.ENRF	Energy flow rate (GJ/ h)
Volume Flow Rate	.PIPE.CTM.CVFR	Volume flow rate (KSCM/ h)
Meter Percent Capacity	.PIPE.CTM.MCP	
Reverse Meter Percent Capacity	.PIPE.CTM.MCPR	Only required for meters with reverse flow
Reverse Flow Rate	.PIPE.CTM.RCVF	Only required for meters with reverse flow
Reverse Energy Flow Rate	.PIPE.CTM.ENRR	Only required for meters with reverse flow

If the metering site includes a gas chromatograph, "real-time instantaneous" values for the readings in the following table are also required.

~~Table 15~~Table 21 Gas Chromatograph Real-Time Data

Data	PI Collect Name Extension	Comments
Methane(C1)	.GC6.OFFICIAL.C1	
Ethane(C2)	.GC6.OFFICIAL.C2	
Propane(C3)	.GC6.OFFICIAL.C3	
N-Butane(NC4)	.GC6.OFFICIAL.C4	
I-Butane(IC4)	.GC6.OFFICIAL.IC4	
N-Pentane(NC5)	.GC6.OFFICIAL.C5	
I-Pentane(IC5)	.GC6.OFFICIAL.IC5	
Neo-Pentane(NeoC5)	.GC6.OFFICIAL.NEC5	
Hexane+(C6+)	.GC6.OFFICIAL.C6+	Hexanes plus higher hydrocarbons
Carbon Dioxide(CO2)	.GC6.OFFICIAL.CO2	
Nitrogen(N2)	.GC6.OFFICIAL.N2	
Heating Value	.GC6.OFFICIAL.HV	
Relative Density	.GC6.OFFICIAL.SG	
Hexane(C6)	.GC9.OFFICIAL.C6	Only required for C9 Gas Chromatograph
Heptane(C7)	.GC9.OFFICIAL.C7	Only required for C9 Gas Chromatograph
Octane(C8)	.GC9.OFFICIAL.C8	Only required for C9 Gas Chromatograph
Nonanes+(C9+)	.GC9.OFFICIAL.C9+	Only required for C9 Gas Chromatograph. Nonanes plus higher hydrocarbons

At gas injection metering installations, gas quality monitoring and data requirements are specified in AEMO's ~~document~~ ~~"~~"Gas Quality Standard and Monitoring Guidelines (DTS)"~~"~~.

~~6.48~~2.8 Data provided by AEMO

For CTMs that do not have provision for gas composition measurement on site, AEMO provides gas composition related data to be applied at metering installations. This data is provided based ~~up~~on the predicted gas source ~~of the gas~~ and the average gas travel time to the region of the metering installation.

Hourly average gas composition (up to C6+), relative density and (volume) heating value data are made available before each hour and are transmitted to the metering installation in time for the data to be used during the following hour.

The following table describes the data made available hourly and transmitted to the metering installations.

~~Table 16~~Table 22 Hourly Average Gas Composition Data Transmitted to Metering Installations

List 62 Gas composition and heating value used for calculating gas compressibility and energy within the RTU

Slot	Item	Units	Comments
10	Hourly Ave Nitrogen	MOLE %	
20	Hourly Ave Carbon Dioxide	MOLE %	
30	Hourly Ave Hydrogen	MOLE %	
40	Hourly Ave Carbon Monoxide	MOLE %	
50	Hourly Ave Methane	MOLE %	
60	Hourly Ave Ethane	MOLE %	
70	Hourly Ave Propane	MOLE %	
80	Hourly Ave Water Content	mg/ m^3	
90	Hourly Ave Hydrogen Sulphide	mg/ m^3	
100	Hourly Ave Oxygen Content	MOLE %	
110	Hourly Ave Butane_Iso	MOLE %	Iso-Butane
120	Hourly Ave Butane_N	MOLE %	Normal Butane
130	Hourly Ave Pentane_Iso	MOLE %	Iso-Pentane
140	Hourly Ave Pentane_Neo	MOLE %	Neo-Pentane
150	Hourly Ave Pentane_N	MOLE %	Normal Pentane
160	Hourly Ave Hexane+	MOLE %	Hexanes plus higher hydrocarbons.
170	Hourly Ave Heptane_N	MOLE %	Normal Heptane
180	Hourly Ave Octane_N	MOLE %	Normal Octane
190	Hourly Ave Nonane_N	MOLE %	Normal Nonane
200	Hourly Ave Decane_N	MOLE %	Normal Decane
210	Hourly Ave Helium	MOLE %	
220	Hourly Ave Argon	MOLE %	
230	Hourly Ave HHV Mass	MJ/ kg	Mass Heating Value
240	Hourly Ave HHV Volume	MJ/ m^3	Volumetric Heating Value
250	Hourly Average Relative Density	-	