

National Grid

National Transmission System



**Technical Information for Connections to  
the National Transmission System**

## Contents

	Page
Introduction	3
Disclaimer	3
Gas Quality Information	4
Metering Information	5
Telemetry Information	7
Gas Quality IO Schedule	8
Metering Information IO Schedule	9
Telemetry Information IO Schedule	10

## **Introduction**

This guidance has been put together to provide additional high level guidance on some of the basic requirements at a “typical” NTS connection point.

It is important to realise that every connection to the NTS will have unique characteristics and the information provided in this document is for guidance only and the contents are not exhaustive.

National Grid Gas plc (“National Grid”) should always be consulted before any investment decisions are undertaken.

## **Disclaimer**

While the information contained in this guidance is believed to be correct at the time of publication and is given in good faith, National Grid, its employees or advisors will not accept any liability for its accuracy, adequacy or completeness, nor will any express or implied warranty be given.

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## Gas Quality Information

The Functional Design Specification for the gas quality system shall include:

- a) Engineering line drawings
- b) Operating philosophy of the gas quality system

The applicant shall supply to National Grid the design and operating parameters.

National Grid and the applicant shall agree the I/O schedule for gas quality:

The applicant shall perform a Chromatograph evaluation to ISO 10723 on site

The applicant shall notify of the Chromatograph evaluation to ISO 10723 more than 5 weeks before the flow of gas

The applicant shall complete the Chromatograph ISO 10723 evaluation, along with end to end checks, at less than three weeks before the planned date for first flows of gas through National Grid facilities, to or from the applicant's system.

Performance evaluation / metering validation reports shall be issued to National Grid by the applicant allowing National Grid at least 7 days to review and accept the reports. National Grid will give its acceptance in writing.

The performance evaluation shall meet the requirements of ISO 10723. The applicant shall validate the system before the relevant commissioning certificate (appendix D) is signed by National Grid.

## Metering Information

The applicant shall provide National Grid with a Metering system Functional Design Specification (FDS) document which shall include:

- a) Type of primary metering to be installed and to what standard – relevant standards are detailed in National Grid specification T/SP/ME/1.
- b) Operating philosophy of the metering system, number of streams, process design conditions including Minimum and Maximum Flowrates, Pressures and Temperature
- c) Engineering line, pressure system, general arrangement and instrumentation drawings for the metering system
- d) Method of calibration for such meters including process conditions to be employed, number of test points etc.
- e) Details of Flow Computers and details of flow calculations/methodology to be employed for the determination of volumetric and energy flow.
- f) Communications of signals to telemetry
- g) Engineering line drawings showing straight lengths of upstream and downstream connecting pipework, relative positions of valves and points of measurement for pressure, temperature and also gas composition.
- h) Details of secondary instrumentation to be installed (Pressure, Temperature and if applicable Differential Pressure measurement) equipment manufacturer, type, specification.
- i) Theoretical Measurement Uncertainty calculations of the whole of the measurement system undertaken to ISO/TR 5168 (+/- 1% on volume and +/- 1.1% on energy or better shall be met as per T/SP/ME/1)

The applicant shall ensure that the Metering equipment is subject to a Factory Acceptance Test (FAT). National Grid shall be invited by the applicant to witness the test at least ten working days before the test and shall be provided with a test procedure at least 14 calendar days before the test.

The applicant shall ensure that the Metering equipment is calibrated by a UKAS accredited facility (or equivalent) to traceable standards. The following requirements must be met:

- a) It shall be calibrated through the same process range as expected for operation and
- b) It shall be calibrated using natural gas, with the same quality spec, as far as is reasonably practicable, to the expected operational gas.
- c) If secondary equipment which may affect the flow of gas is intended to be used in operation, the metering equipment shall be calibrated with secondary equipment in situ.

National Grid shall be invited to witness the calibration test and shall be provided with the calibration test procedure at least 14 calendar days before the test.

The applicant shall perform the metering SAT (site acceptance test) at less than three weeks before the planned date for the flow of gas.

The applicant shall notify National Grid of the SAT validation at least 14 days before the validation

Calibration and validation reports shall be issued to National Grid by the applicant allowing National Grid at least 7 days to review and accept the reports. National Grid will give its acceptance in writing.

The metering facility shall be validated to meet National Grid's T/SP/ME/1 specification by the applicant before the commissioning certificates will be signed.

The Functional Design Specification for the gas quality system shall include:

- a) Engineering line drawings
- b) Operating philosophy of the gas quality system

The applicant shall supply to National Grid the design and operating parameters.

National Grid and the applicant shall agree the I/O schedule for gas quality:

The applicant shall perform a Chromatograph evaluation to ISO 10723 on site

The applicant shall notify of the Chromatograph evaluation to ISO 10723 more than 5 weeks before the flow of gas

The applicant shall complete the Chromatograph ISO 10723 evaluation, along with end to end checks, at less than three weeks before the planned date for first flows of gas through National Grid facilities, to or from the applicant's system.

Performance evaluation / metering validation reports shall be issued to National Grid by the applicant allowing National Grid at least 7 days to review and accept the reports. National Grid will give its acceptance in writing.

The performance evaluation shall meet the requirements of ISO 10723. The applicant shall validate the system before the relevant commissioning certificate (appendix D) is signed by National Grid.

## **Telemetry Information**

The Operator shall install, commission, operate and maintain communication equipment to provide signals to National Grid Gas of type, quality and quantity to be agreed between National Grid Gas and the Storage Operator.

The signals provided shall be provided as RS485 Serial Modbus RTU or as agreed by both Parties.

### A specimen Gas Quality IO Schedule

Characteristic	Unit	Specified range	Uncertainty	Comments for NG attention	NG data item	Connectivity	Intersite Modbus Address	NG Modbus address	State 0	State 1	State 2	State 3
<b>Signals from the 3rd Party Facility NG Telemetry Equipment</b>						Serial Link						
Water Dewpoint	oC (at Line Pressure)	(-60 to +20)	( $\pm 2$ ) C		H2ODew1	Serial Link	30009					
Hydrocarbon Dewpoint	oC (at 27 Barg)	(-30 to +10)	( $\pm 2$ ) C		HcDew1	Serial Link	30010					
Oxygen	Mole %	0 to 0.25	( $\pm 0.01$ )		O2 1	Serial Link	30011					
Carbon Dioxide	Mole %	0 to 5	( $\pm 0.1$ )		CO2 1	Serial Link	30012					
Hydrogen Sulfide (including COS)	PPM	0 to 5	( $\pm 0.1$ ) PPM		H2S1	Serial Link	30013					
Total Sulphur	mg/m3	0 to 100	( $\pm 1$ ) mg/m3		S1	Serial Link	30014					
Incomplete Combustion Factor.		(-3 to +2)	( $\pm 0.02$ )		IncomComb1	Serial Link	30015					
Soot Index		0 to 1	( $\pm 0.02$ )		Sooting Index1	Serial Link	30016					
Nitrogen	Mole %	0 to 10	( $\pm 4\%$ ) of measurement		N2 1	Serial Link	30018					
CV	MJ/m3	35 to 44	( $\pm 0.1$ ) MJ/m3		CV1	Serial Link	30019					
Specific Gravity.		0.5 to 0.7	( $\pm 0.01$ )		SG1	Serial Link	30020					
Wobbe Number	MJ/m3	45 to 54	( $\pm 0.1$ ) MJ/m3		WB1	Serial Link	30021					
Gas Quality Alarm					System1	Serial Link	10008		ALARM	OK		

### A specimen Metering IO Schedule

Characteristic	Unit	Specified range	Uncertainty	Comments	NG data item	Connectivity	Intersite Modbus Address	NG Modbus address	State 0	State 1	State 2	State 3
<b>Signals from the 3rd Party to National Grid Telemetry RTU.</b>												
Instantaneous Standard Volume Flow Rate System ENTRY (Injection)	Msm3 /day	0-45 Msm3/day	(± 1% of Flow)		F1 (Import to Storage)	Serial Link	30003					
Instantaneous Energy Flow Rate System ENTRY (Injection)	TJ /day	0-1800 TJ/day	(± 1.1% of Flow)		EF1	Serial Link	30004					
Integrated Standard Volume Flow System ENTRY (Injection)	Msm3	0-999,999		1000 SCM pulse significance value, to increment to 999,999 then the count will roll over to 0.	Integ1 Imp	Serial Link	31001/2					
Integrated Energy Flow Rate System ENTRY (Injection)	TJ	0-999,999		40,000 Mjoules pulse significance value, to increment to 999,999 then the count will roll over to 0.	Integ EF1 Imp	Serial Link	31003/4					
Instantaneous Standard Volume Flow Rate System EXIT (Withdrawal)	Msm3 /day	0-45 Msm3/day	(± 1% of Flow)		F2 (Export to Storage)	Serial Link	30005					
Instantaneous Energy Flow Rate System EXPORT (Withdrawal)	TJ /day	0-1800 TJ/day	(± 1.1% of Flow)		EF2	Serial Link	30006					
Integrated Standard Volume Flow System EXPORT (Withdrawal)	Msm3	0-999,999		1000 SCM pulse significance value, to increment to 999,999 then the count will roll over to 0.	Integ1 Exp	Serial Link	31005/6					
Integrated Energy Flow Rate System ENTRY (Withdrawal)	TJ	0-999,999		40,000 Mjoules pulse significance value, to increment to 999,999 then the count will roll over to 0.	Integ EF1 Exp	Serial Link	31007/8					
Meter Pressure.	Barg	0-100 bar	(± 0.5 ) barg		P4	Serial Link	30007					
Meter Temperature	oC	(-10 to +40)	(± 0.5 ) deg C		T2	Serial Link	30008					
CV	MJ/m3	35 to 44	(± 0.1 ) MJ/m3		CV1	Serial Link	30013					
Specific Gravity.		0.5 to 0.7	(± 0.01 )		SG1	Serial Link	30016					
Remote Pressure (NTS Side of valve)	Barg	0-100 bar	(± 0.5 ) barg		P3	Serial Link	30020					
Flow measurement Fault Alarm					Metering1	Serial Link	10008		ALARM	OK		
Gas Quality Alarm					System1	Serial Link	10009		ALARM	OK		

## A specimen Telemetry IO Schedule

Characteristic	Unit	Specified range	Uncertainty	Comments	NG data item	Connectivity	Intersite Modbus Address	Modbus Format	NG Modbus address	State 0	State 1	State 2	State 3
<b>Signals from 3rd Party to National Grid Telemetry RTU</b>													
Instantaneous Standard Volume Flow Rate System	MSm3 /day	0-45 MSm3/day	(± 1% of Flow)		F1	Serial Link	30003	1 Modbus Analogue Word					
Instantaneous Energy Flow Rate System	TJ /day	0-1800 TJ/day	(± 1.1% of Flow)		EF1	Serial Link	30004	1 Modbus Analogue Word					
Integrated Standard Volume Flow System	MSm3	0-999,999		1000 SCM pulse significance value, to increment to 999,999 then the count will roll over to 0.	Integ1 Imp	Serial Link	31001/2	2 Modbus Analogue Words					
Integrated Energy Flow Rate System	TJ	0-999,999		40,000 Mjoules pulse significance value, to increment to 999,999 then the count will roll over to 0.	Integ EF1 Imp	Serial Link	31003/4	2 Modbus Analogue Words					
Integrated Standard Volume Flow System EXPORT (Withdrawal)	MSm3	0-999,999		1000 SCM pulse significance value, to increment to 999,999 then the count will roll over to 0.	Integ1 Exp	Serial Link	31005/6	2 Modbus Analogue Words					
Integrated Energy Flow Rate System ENTRY (Withdrawal)	TJ	0-999,999		40,000 Mjoules pulse significance value, to increment to 999,999 then the count will roll over to 0.	Integ EF1 Exp	Serial Link	31007/8	2 Modbus Analogue Words					
Instantaneous Standard Volume Flow Rate System EXIT (Withdrawal)	MSm3 /day	0-45 MSm3/day	(± 1% of Flow)		F2 (Export to Storage)	Serial Link	30005	1 Modbus Analogue Word					
Instantaneous Energy Flow Rate System EXPORT (Withdrawal)	TJ /day	0-1800 TJ/day	(± 1.1% of Flow)		EF2	Serial Link	30006	1 Modbus Analogue Word					
Meter Pressure.	Barg	0-85 bar	(± 0.5 ) barg		P4	Serial Link	30007	1 Modbus Analogue Word					
Meter Temperature	oC	(-10 to +40)	(± 0.5 ) deg C		T2	Serial Link	30008	1 Modbus Analogue Word					
Water Dewpoint	oC (at Line Pressure)	(-100 to +20)	(± 2 ) C		H2ODew1	Serial Link	30009	1 Modbus Analogue Word					
Hydrocarbon Dewpoint	oC (at 27 Barg)	(-100 to +20)	(± 2 ) C		HcDew1	Serial Link	30010	1 Modbus Analogue Word					
Oxygen	Mole %	0 to 0.25	(± 0.01 )		O2 1	Serial Link	30011	1 Modbus Analogue Word					
Carbon Dioxide	Mole %	0 to 5	(± 0.1 )		CO2 1	Serial Link	30012	1 Modbus Analogue Word					
Hydrogen Sulfide (including COS)	PPM	0 to 5	(± 0.1 ) PPM		H2S1	Serial Link	30013	1 Modbus Analogue Word					
Total Sulphur	mg/m3	0 to 100	(± 1 ) mg/m3		S1	Serial Link	30014	1 Modbus Analogue Word					
Incomplete Combustion Factor.		(-3 to + 2)	(± 0.02 )		IncomComb1	Serial Link	30015	1 Modbus Analogue Word					
Soot Index		0 to 1	(± 0.02 )		Sooting Index1	Serial Link	30016	1 Modbus Analogue Word					
Nitrogen	Mole %	0 to 10	(± 4%) of measurement		N2 1	Serial Link	30018	1 Modbus Analogue Word					
CV	MJ/m3	35 to 44	(± 0.1 ) MJ/m3		CV1	Serial Link	30019	1 Modbus Analogue Word					
Specific Gravity.		0.5 to 0.7	(± 0.01 )		SG1	Serial Link	30020	1 Modbus Analogue Word					
Wobbe Number	MJ/m3	45 to 54	(± 0.1 ) MJ/m3		WB1	Serial Link	30021	1 Modbus Analogue Word					
Flow measurement Fault Alarm					Metering1	Serial Link	10007	1 Modbus Digital Word		ALARM	OK		
Gas Quality Alarm					System1	Serial Link	10008	1 Modbus Digital Word		ALARM	OK		
Remote Pressure P3	Barg	0-100 bar	(± 0.5 ) barg		P3	Serial Link	30023	1 Modbus Analogue Word					
<b>Possible Signals from NG Telemetry RTU to 3rd Party</b>													
BV1 Open Indication					V01_RO	Serial Link	1	1 Modbus Digital Word		ERROR	SHUT	OPEN	TRANS
BV1 Close Indication					V01_RC	Serial Link	2	1 Modbus Digital Word		ERROR	SHUT	OPEN	TRANS
PSU Alarm (Mains Fail)					Mains1_S	Serial Link	3	1 Modbus Digital Word		FAILED	OK		
Site Inlet Pressure	Bar g	0 to 100	(± 0.5 ) barg		P1_S	Serial Link	40001	1 Modbus Analogue Word					
Site Outlet Pressure	Bar g	0 to 100	(± 0.5 ) barg		P2_S	Serial Link	40003	1 Modbus Analogue Word					