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National Grid

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Technical
Specification

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**Operational Metering
Summator**

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OPERATIONAL METERING SUMMATOR

FOREWORD

This Specification defines National Grid's technical requirements for Operational Metering Summators for use at power stations and at Grid Supply Points to provide operational metering data for Grid System Management and generator response data for the National Grid Ancillary Services Business (ASB). This specification is one within the Substation information, Control and Protection suite of technical specifications.

The operational metering data required includes both analogue and digital measurements of active and reactive power flows and energy measurements of the same quantities. The generator response data comprises time tagged values of generator net sent out active power and frequency values.

1 SCOPE

This Specification describes the functional and performance requirements for a Summation Unit, herein known as the Operational Metering Summator (OMS).

2 REFERENCES

National/International standards

IEC 60297-1 Dimensions of Mechanical Structures of the 482.6 mm (19 in) Series - Part 1: Panels and Racks.

CCITT Standards V24/V28.

EIA Standard RS 232.

National Grid Technical specifications (NGTS)

NGTS 1 Ratings and General Requirements for Plant, Equipment, Apparatus and Services for the National Grid System and Direct Connections to it.

NGTS 2.24 Substation Information, Control, Protection and Metering

NGTS 3.9.7 Substation Clock.

NGTS 3.12.1 48 V D.C. Supplies.

NGTS 3.12.2 110 V D.C. Supplies.

NGTS 3.24.15 Environmental and Test Requirements for Electronic Equipment

3 DEFINITIONS

The following definitions are provided for clarification within this Specification:-

(a) Demand Values

Average values of active and reactive power over a demand period. The demand period is normally 30 minutes commencing on the hour and half hour. The demand values are identified by the time at the end of the demand period.

(b) Summation

The process of addition/subtraction/scaling of inputs according to a defined algorithm to produce outputs.

(c) UPI

Units per Impulse. Where units mean kWh or kVAh and Impulse means a single transition of a pulse.

(d) UPP

Units per Pulse. As for (iii) above but with the kWh/kVAh value associated with the complete pulse consisting of two transitions.

4 GENERAL REQUIREMENTS

Informative: Overview

The function of the Operational Metering Summator is to receive a number of pulse type inputs from energy meters and from these produce analogue outputs, pulse type outputs and serial data links on which measured data is transmitted to other devices.

The inputs will be voltage-free contacts provided either directly from Settlement Metering energy meters or more normally via interposing relays fed from the meters. Each input pulse received by the OMS will represent a fixed amount of either active or reactive energy dependent on the meter type. The energy meters providing the pulse inputs are high accuracy units, typically of 0.2% accuracy class, with pulse rates of typically between 2 to 4 Hz at the nominal full load rating of the circuits involved.

The analogue outputs representing active and reactive power measurements are outputs derived from one or more of the pulse type inputs. The pulse type outputs providing part of the energy measurement requirements of the operational metering data are a set of Summation totals derived from the inputs applied to the OMS.

The actual number of inputs required for a unit will depend on the power station or site involved (eg the number of generating sets, station transformers, auxiliary gas turbines, etc), but a unit able to accommodate up to 32 inputs will be suitable for the great majority of applications.

The analogue and pulse type outputs comprising the Operational Metering data will initially be taken to a Telecontrol or SCADA outstation but for future application the OMS shall be provided with a serial data link output for this requirement.

To suit some site layouts and existing cabling arrangements the OMS needs to be available in the form of two physically separate units. The required arrangement consisting of a unit known as a front end unit (FE) which receives the meter pulse inputs and is located near the source contacts and a second unit known as a processing/output unit (PE) located up to 2 km distant. The PE shall be connected to the FE by a dedicated serial data link. Figure 1 shows the overall arrangement of the OMS using FE and PE units.

Other sites (in particular Grid Supply Points) can utilize a unit arrangement where all the facilities identified as available from either the FE or PE units in the following clauses are accommodated in one

physical unit.

Meter Input Channels

- 4.1 The OMS shall have at minimum 16 meter input channels but must also have an option to accommodate up to 32 input channels.
- 4.2 The inputs shall be suitable for operation with voltage-free contacts.
- 4.3 The supply voltage for the inputs shall be supplied by the OMS and not be greater than 43 V D.C.
- 4.4 The inputs shall be isolated from the power supply input to the OMS and have protection suited to the electrical environment.
- 4.5 The inputs shall be suitable for pulse rates up to 6 per second with a minimum pulse duration of 70 m sec and shall reject short interval pulses of up to 20 m sec in duration.

Frequency Measurement Inputs

- 4.6 The OMS (FE unit where FE and PE pair are used) shall have two separate isolated inputs from which a frequency measurement is made of one of other of the two voltage signals applied to the two inputs.
- 4.7 The measured frequency values shall be time tagged average values taken at one second intervals.
- 4.8 The measurement technique for the frequency shall produce a 'true average measurement' for the one second interval by either averaging a number of measurements during the second or by using a time interval measurement spanning a significant proportion of the second
- 4.9 The inputs shall be suitable for a voltage signal having the following characteristics:-
 - (a) 50 V to 132 V rms (to cover both 63.5 V and 110 V sources)
 - (b) 47 to 52 Hz
 - (c) The burden imposed by each frequency input shall not exceed 1.0 VA.

Clock Input

- 4.10 The OMS (PE unit where FE and PE pair are used) shall have an additional isolated input channel suitable for receiving a voltage-free contact closure from an external Substation Clock as specified in NGTS 3.9.7.
- 4.11 The input channel and supply voltage requirements shall be as specified for the meter pulse inputs.
- 4.12 The contact closure will be between 150-250 m sec (nominal 200 m sec), at 30 minute intervals.
- 4.13 The OMS shall include a battery backed crystal clock with long term accuracy of better than one part in 10^6 for its internal timing functions with a facility to set the clock to the real time and to be regularly synchronised to the leading edge of a 30 minute pulse input from an external Substation Clock.

Analogue Outputs

- 4.14 The OMS shall at minimum provide 16 bi-directional current loop outputs.
- 4.15 Each output shall be a 0 to +/- 10 mA (nominal) constant current loop suitable for resistive loads between zero and 1 k ohms with capacitance to earth (protective earth) of up to 100 nF from each connection to the resistive load.