SAGC – The Network Code Amendment

Presentation to: **GCAC**

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Amendment Support Required

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The GCAC is hereby requested to support the amendment of the South African Grid Code :

- The Network Code, Version 10.0
  - amendment of Clause 4.3 (2) and
  - addition of Clause 4.3 (3)

Background

The requirement for the amendment was prompted by the audit that was conducted at Eskom Transmission substations which required the demonstration or the evidence of the accuracy of the Analogue to Digital Converter (ADC) of the RTU analogue peripheral cards.

- The Grid Code specified RTU ADC accuracy class of 0.01
- There was no evidence of how the specified accuracy was determined or whether the RTUs complied with this requirement.
- There was an audit finding against Transmission due to lack of evidence of this accuracy

This finding led to the requirement to test and document the RTU ADC accuracy.

Test Results

The following devices were tested as they have a large install base in Eskom Transmission and will be used as the bases for the amendment:

The IST Talus RTU and the GE D20 RTU

- The devices under test were configured and tested for the range of 0 - 20mA input into the RTU.
- The test was performed over 21 readings starting at 0.5mA and then at steps of 1mA for subsequent injections up to 20mA.
- The following results were recorded:

Parameter	IST Talus RTU	GE D20 RTU
Worst accuracy (1 – 5 mA)	0.49%	0.42%
Worst accuracy (6 – 20 mA)	0.08%	0.06%

•Note : Accuracy measurement less than 1mA could not be reliably and accurately measured

Accuracy Class

- Accuracy Class
  - Meter accuracy classes are defined in IEC and ANSI standards, and marked by an accuracy class index, which is a number representing the maximum % error at ***reference test conditions***.
- Definition of class index (IEC 62051-11)
  - *number which gives the limits of the permissible percentage error, for all values of current between 0,1 I_b and I_{max}, or between 0,05 I_n and I_{max}, for the unity power factor (and in the case of polyphase meters with balanced loads) when the meter is tested under reference conditions (including permitted tolerances on the reference values) as defined in the parts defining particular requirements*

Metering and Measurements Standards

- IEC Standards applicable to Metering and Measurements
  - IEC 62053-21: Particular Requirements – Static Meters for active energy (classes 1 and 2)
  - IEC 62053-22: Particular Requirements – Static Meters for active energy (classes 0.2S and 0.5S)
  - IEC 60688: Electrical measuring transducers for converting a.c. electrical quantities to analogue or digital signals

- These standards establish the physical aspects and acceptable performance criteria by specifying the performance test such as starting current and accuracy over a range of load currents, voltages and power factors and in doing so provide a uniform method of evaluating different products.

- The standards provide for multiple test points to prove the operation of the meter/transducer over a dynamic range and reference conditions.

Analogue to Digital Accuracy

- What does analogue to digital conversion accuracy refer to?
- What standard(s) defines the accuracy requirements for analogue to digital conversion?
  - RTUs are not specified to any international standards in terms of accuracy of the analogue to digital conversion
  - Manufacturers indicate accuracy of these inputs to their own (undefined) standards
- RTUs are unlikely to be certified and tested against any IEC metering/measurements standards for accuracy class.
  - RTUs do not have measurements elements and do not measure anything – hence you cannot test them against the previously listed standards.
  - They are converters of analogue or digital signals

Conclusion and Recommendation

- Based on preceding information, an accuracy class index value cannot be specified for the RTU.
- It is recommended that the RTU accuracy be specified in percentage as indicated below

Equipment	Analogue input range	Accuracy
RTU	1mA ≤ I ≤ 5mA	0.5 %
	5mA < I ≤ 20mA	0.1 %