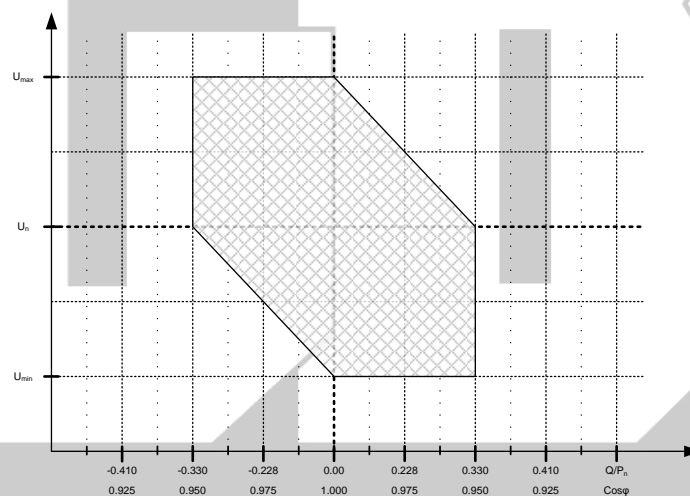


### Renewable Grid Code Compliance

The REIPPP has spurred renewable investment and independent power production. Queries with regard to the renewable grid code compliance have been directed toward cable manufacturers and suppliers. This technical bulletin attempts to clarify responsibilities and possible areas for cable sizing considerations with respect to the renewable grid code.

Version 2.8 (July 2014) of the South African grid connection code for renewable power plants ("RPPs") describe the requirements for reactive power and voltage control range for RPPs of Category C in Figure 11 on Pg. 25, repeated here for clarity:

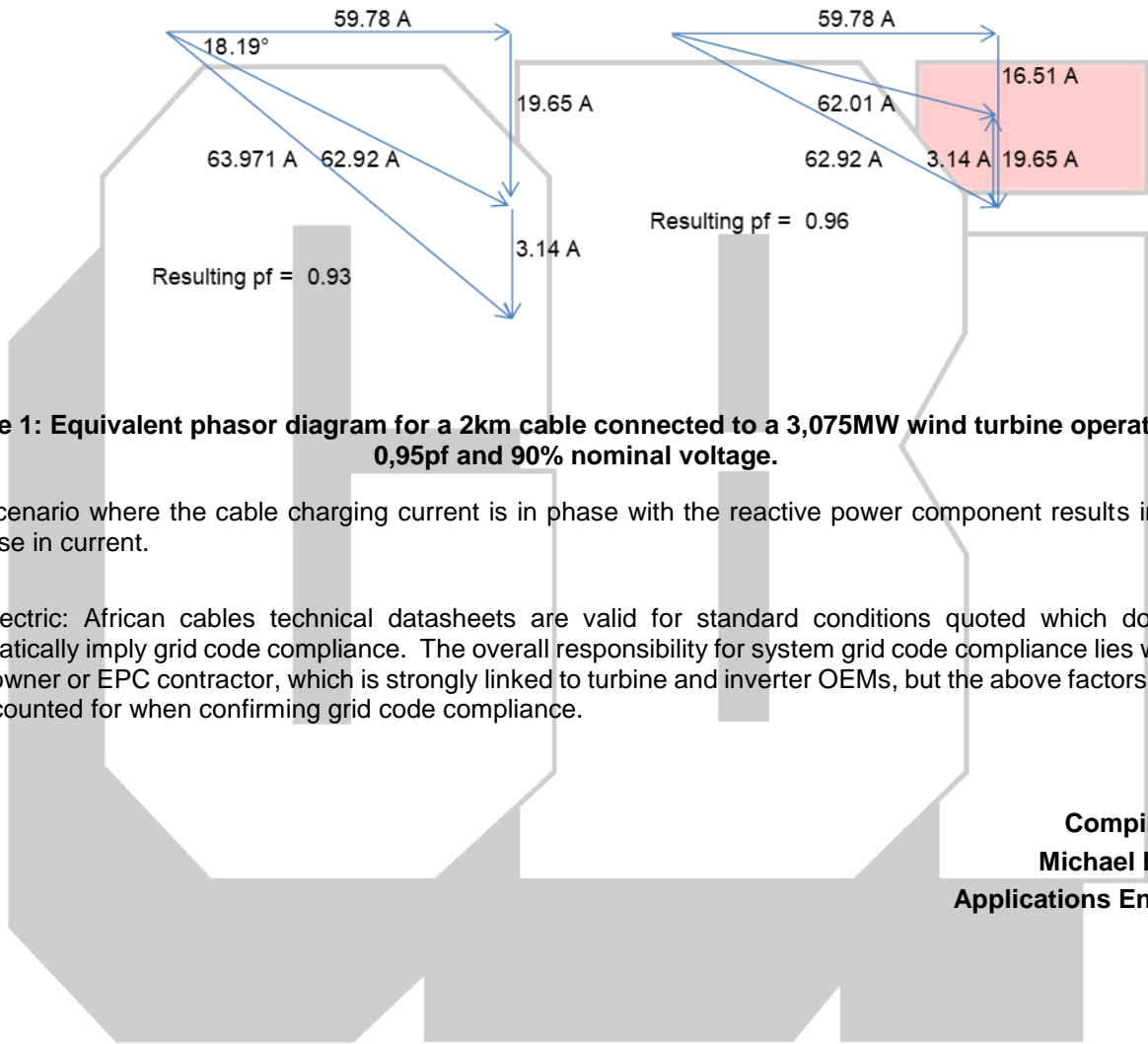


**Figure 1: Requirements for reactive power and voltage control range for RPPs of category C (Figure 11 Pg. 25 of Version 2.8 (July 2014) of the South African grid connection code for renewable power plants.**

The grid voltage, for a category C plant, can fluctuate between  $1,1$  and  $0,9U_n$  but can be mitigated through an automatic tap changer on the MV side of the step up transformer at the point of connection ("POC"). If no automatic tap changer is present cable selection can be affected as 11% more current would contribute 23% more heat

Plants can operate as net importers or net exporters of reactive power (Q). Contributions to cable current carrying capacities can be partially mitigated through power factor correction ("PFC") at the POC but can result in upwards of 7-8% additional current (depending on cable length).

As an example of the above a 2km 400mm<sup>2</sup> Al single core cable connected to a 3,075MW wind turbine operating at 0,95pf and 90% nominal voltage can have the following equivalent current depending on whether the plant is exporting or importing reactive power.



**Figure 1: Equivalent phasor diagram for a 2km cable connected to a 3,075MW wind turbine operating at 0,95pf and 90% nominal voltage.**

The scenario where the cable charging current is in phase with the reactive power component results in a 7% increase in current.

CBI-electric: African cables technical datasheets are valid for standard conditions quoted which does not automatically imply grid code compliance. The overall responsibility for system grid code compliance lies with the plant owner or EPC contractor, which is strongly linked to turbine and inverter OEMs, but the above factors should be accounted for when confirming grid code compliance.

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