![Eskom]	**Standard**	**Technology**

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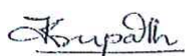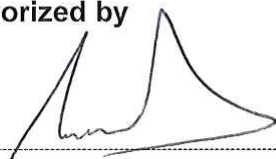
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Executive Summary

The fibre optic cables installed on Eskom lines and cables (e.g. ADSS, WRAP, ADLash™, Duct) provides the telecommunications medium which is used for a variety of services within Eskom, namely Transmission, Distribution and Eskom Telecommunications. Based upon the requirements of the various divisions, this document provides guidance on the recommended allocation of fibre cores contained within each fibre optic cable, for the different services and to the different users.

1.   Introduction

This document provides guidance on the allocations of fibre cores for the different Eskom requirements on aerial optical fibre on all lines (fibre between two substations) as well as underground duct fibre cables. Fibre optic cables, as the telecommunication medium, benefits the power network by allowing a quick, robust, dependable, reliable and high capacity telecommunications medium. This telecommunication medium provides for Eskom's operational requirements (teleprotection (protection), telecontrol, hotlines, direct voice, etc.), ET's telecoms network and Eskom's IT requirements (SAP, email, etc.).

2.   Supporting clauses

2.1   Scope

This document provides guidance on the allocation of fibre optic cores to the different services within Eskom and on all future fibre optic cables and will be applied retrospectively on existing lines where possible.

2.1.1   Purpose

The purpose of this document is to provide guidance on the allocation of fibre optic cores to the different services within Eskom and to third parties where applicable. It is also in support of the Eskom Telecommunications Strategy Framework.

2.1.2   Applicability

This document shall apply to Eskom Transmission, Distribution and Eskom Telecommunications.

2.2   Normative/informative references

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

2.2.1   Normative

[1]   ISO 9001 Quality Management Systems.

[2]   32-1200: Eskom Telecommunications Strategy Framework

[3]   240-134119475 Teleprotection Roadmap

[4]   ESG 32-1200 Eskom Telecommunications Strategy Framework (ETSF)

[5]   240-89335081 Telecommunications Transport Network Roadmap Standard

[6]   240-46204188 Technology Roadmap for Fibre Optic Systems

2.2.2   Informative

None

2.3   Definitions

2.3.1   General

Definition	Description
Cable	Fibre optic cable which includes OPGW, ADSS, WRAP, ADLash^{TM} and Duct
Third Party	Any external party running services not required/utilized by Eskom.

2.3.2 Disclosure classification

Controlled disclosure: controlled disclosure to external parties (either enforced by law, or discretionary).

2.4 Abbreviations

Abbreviation	Description
ADLash™	Lashed fibre optic cable
ADSS	All Dielectric Self-Supporting fibre optic cable
DNP	Distributed Network Protocol
Dx	Distribution
ET	Eskom Telecommunication
IEC	International Electrotechnical Commission
IP	Internet Protocol
IPP	Independent Power Producer
IT	Information Technology
MPLS	Multiprotocol Label Switching
MSAP	Multiservice Access Platform
OPGW	Optical Ground Wire
OT	Operational Technology
PAC	Protection and Control
SAP	Systems, Applications and Products
SAPP	South African Power Pool
SCADA	Supervisory Control and Data Acquisition
SLA	Service Level Agreement
Tx	Transmission
VPN	Virtual Private Network

2.5 Roles and responsibilities

It is the responsibility of Transmission, Distribution and Eskom Telecommunications to ensure that this document is adhered to.

2.6 Process for monitoring

Random checks may be performed by Eskom Telecommunications to ensure that the prescribed policy is complied with. This document may be amended by mutual agreement and subject to the approval of the Fibre Optic Care Group, should the requirements of the various participating parties change.

2.7 Related/supporting documents

Not applicable.

3. Fibre Core Allocation Descriptions

3.1 Eskom Telecommunications Services

Eskom Telecommunications provides essential telecommunication services for Eskom's operational, business and IT systems (e.g. email, SAP). Hence Eskom Telecommunications will be allocated the most number of fibre optic cores as it provides the Operational and IT Telecomms services for all the Eskom Divisions,. Major services catered by Eskom Telecommunications are as follows.

1) Mission critical services (voice, teleprotection and SCADA services); which are between the control centres and the various substations and throughout the country, for the control, monitoring and operation of the power system which uses the backbone network. Twenty percentage (20%) of the cores will be allocated to the ET backbone network.

2) Access network; which are presently consisting of Synchronous Digital Hierarchy radio, Plesiochronous Digital Hierarchy/Ethernet Microwave Access Radio and Optical Add Drop Multiplexers. Minimum of a pair (2 cores) would be required for the same.

3) For migration purposes - As per ESG 32-1200 Eskom Telecommunications Strategy Framework (ETSF) requirements and document 240-89335081, Telecommunications Transport Network Roadmap Standard, MSAP is used as an intermediate technology for OT data services while migrating towards IP/MPLS. The transport network will be migrated to fibre optic and in the access network; a mix of fibre optic cables and radio links will be used. Hence, for the migration purposes, one pair may be required in 24 cores and two pairs in 48 cores.

4) Smart Grid - The requirements for smart grid are for Smart Grid Monitoring as well as Control & Optimisation (for example Weather Management etc.). Separate VPNs may be established on a single fibre. A single fibre channel (2 cores) would be required.

3.2 Teleprotection

Teleprotection aids protection relays/systems to ensure that faults on the powerlines are isolated and removed from the power system in the quickest possible time. Without teleprotection on these protection schemes, the fault clearance time could be lengthened and the following consequences could occur: severe damage to electrical equipment (especially transformers), instability of parts or the entire power system which would result in major outages (e.g. cities/provinces) or country wide blackout. The "Teleprotection Roadmap", document number, 240-134119475, states that Teleprotection (Protection) requires dedicated (dark) fibre optic cables. Hence, minimum of 2 pairs is required (for Main 1 & Main 2 Protection) in a 12, 24 and 48 core cable. It may require more in special scenarios, which will take priority over other allocations.

3.3 Substation Automation

One of the strategic visions for Protection and Control (PAC) systems is Inter-Substation Communication, leveraging on IEC 61850 for wide area substation communications, as well as substation-to-substation communications for protection, automation and control. The reasons for using IEC61850 is because conventional client server protocols such as IEC101 and DNP 3.0 are connection oriented and do not meet the performance requirements for many PAC applications. Also, they do not support high speed peer-to-peer communications. Using generic object oriented substation events (GOOSE-based) messaging, substation-to-substation communication can be achieved and functionality such as IEC 61850 based Accelerated Line Protection is possible. Therefore, it will be a requirement to have high speed, deterministic, secure and reliable communications between the substations. This need may be serviced through either dedicated fibre links or a suitable Telecoms service.

3.4   IPP

Dx and IPP sites tie into Transmission sites and may require more than one fibre pair for protection (teleprotection), control and telecommunication. Depending on each individual site's telecommunication requirements and if there are other Dx or IPP sites that require connectivity, fibre pair requirements might change. IPPs usually require 6 cores minimum, to allow for Regional, National and Standby National Circuits per IPP.

3.5   SAPP

A separate fibre pair is required for SAPP to separate telecommunication service required for SAPP from each utility and also to ensure cyber security requirements are met. Telecommunication service, allocation of new services, maintenance and performance will be centrally managed by SAPP situated in Zimbabwe.

3.6   Spares

Thirty percent (30%) of the cores from the 12, 24 and 48 core cables will be reserved as spares i.e. 3 cores for 12 core cable, 7 cores for 24 core cable and 14 cores for 48 core cable. These spares will be used for future expansions, unique or temporary situations that arise from time to time as well as should a fibre link partially breakdown or cores be damaged, etc.

3.7   Third Party

As explained above, majority of the fibre cores will be allocated to Eskom to meet the requirements of the various functional areas and 10% of the 12, 24 and 48 cores will be allocated to third parties as shown in the table below. i.e. For 12 core cable it will be 1 core,24 core cable it will be 2 cores and 48 core cable it will be 4 cores for third party as per the percentages.

Table 1: Fibre Allocation Percentages

FUNCTIONAL AREAS	Allocation (%)
Eskom (ET,Teleprotection,Dx/IPP,SAPP,Spares)	90
Third Party	10

In case of emergency situations or special circumstances, expansion is possible into the spare allocation which will be managed by the respective SLA's. However Eskom requirements and services take precedence over third party requirements regarding the spares.

4.   Authorization

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5. Revisions

Date	Rev	Compiler	Remarks
Nov 2018	2	K Jose	Document due for revision
Nov 2013	1	V Naidu	First issue Allocation changed to include 96 core Allocation change to more core to Broadband Infraco

6. Development team

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