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Contents

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Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee Access, Terminals, Transmission and Multiplexing (ATTM).

Introduction

As various European operators consider the deployment of fibre-fed remote nodes that contain ADSL2+/VDSL2 DSLAM equipment, it is necessary to consider the means of powering such remotely located equipment. One such method, known as "reverse power feed", transmits the power from the customer premises to the fibre-fed remote node using the distribution-side copper network. ETSI TM6 has agreed to create a new document that defines a reverse power feed transmission standard and which allows European operators to source suitably compliant equipment for inclusion in their networks.

1 Scope

The present document identifies the scope of a reverse power feed standard or standards that will allow operators to be able to source suitably compliant equipment for inclusion in their networks.

The present document will identify the requirements for reverse power feed, consider the coexistence of reverse power feed with POTS and scenarios involving the deployment of reverse power feed for cabinet and distribution point locations.

Other issues for consideration include:

- Safety.
- Efficiency.
- Power Back-up.
- Performance monitoring (for further study).
- Reliability (for further study).
- Power-sharing (for further study).
- Billing (for further study).

Other issues such as local laws, unbundling rules and cost are considered out of scope.

2 References

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Not applicable.

2.2 Informative references

The following referenced documents are not essential to the use of the present document but they assist the user with regard to a particular subject area. For non-specific references, the latest version of the referenced document (including any amendments) applies.

[i.1] IEEE 802.3: "LAN/MAN CSMA/CD (Ethernet) Access Method".

NOTE: Available at http://standards.ieee.org/getieee802/802.3.html.

[i.2] IR Cooper, DW Faulkner: "Reverse Powering Over DSL".

[i.3] ON Semiconductor AND8333/D: "High Power PoE Applications, On Semiconductor application sheet", April 2008.

[i.4] ETSI TR 102 614: "Environmental Engineering (EE); Reverse powering of small access network node by end-user equipment : A4 interface".

[i.5] ETSI EN 300 132-2: "Environmental Engineering (EE); Power supply interface at the input to telecommunications equipment; Part 2: Operated by direct current (dc)".

[i.6] ETSI ES 202 971: "Access and Terminals (AT); Public Switched Telephone Network (PSTN); Harmonized specification of physical and electrical characteristics of a 2-wire analogue interface for short line interface".

[i.7] ETSI TS 102 533: "Environmental Engineering (EE) Measurement Methods and limits for Energy Consumption in Broadband Telecommunication Networks Equipment".

[i.8] Code Of Conduct on Energy Consumption of Broadband Communication Equipment European Commission Directorate-General, Joint Research Centre; Final v2: 17 July 2007.

[i.9] CENELEC EN 60950-1: "Information Technology Equipment - Safety Part 1 General requirements (IEC 60950-1 2005 Modified)".

[i.10] CENELEC EN 60950-21: "Information Technology Equipment - Safety. Part 21 Remote Power Feeding (IEC 60950-21:2002)".

[i.11] BT contribution 08CC-020, "Remote Node Powering", ITU SG-15, Campbell, CA, 15-19 Sept. 2008.

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3 Abbreviations

For the purposes of the present document, the following terms and definitions apply:

CO	Central Office
CPE	Customer Premises Equipment
DP	Distribution Point
NTE	Network Termination Equipment
ONU	Optical Network Unit
PD	Powered Device
PoE	Power over Ethernet
POTS	Plain Old Telephony Service
POTSA	POTS - Analogue presentation
POTSD	POTS - derived
PSE	Power Sourcing Equipment
RFT	Remote Feeding Telecommunication
RGW	Residential GateWay
SELV	Safety or Separation Extra Low Voltage
SG	Service Gateway

TNV Telecommunication Network Voltage

4 Reverse Power Feed for Remote Nodes

4.1 Reverse Power Feed Background

The basic architecture of a reverse power feed system is shown below in figure 1.

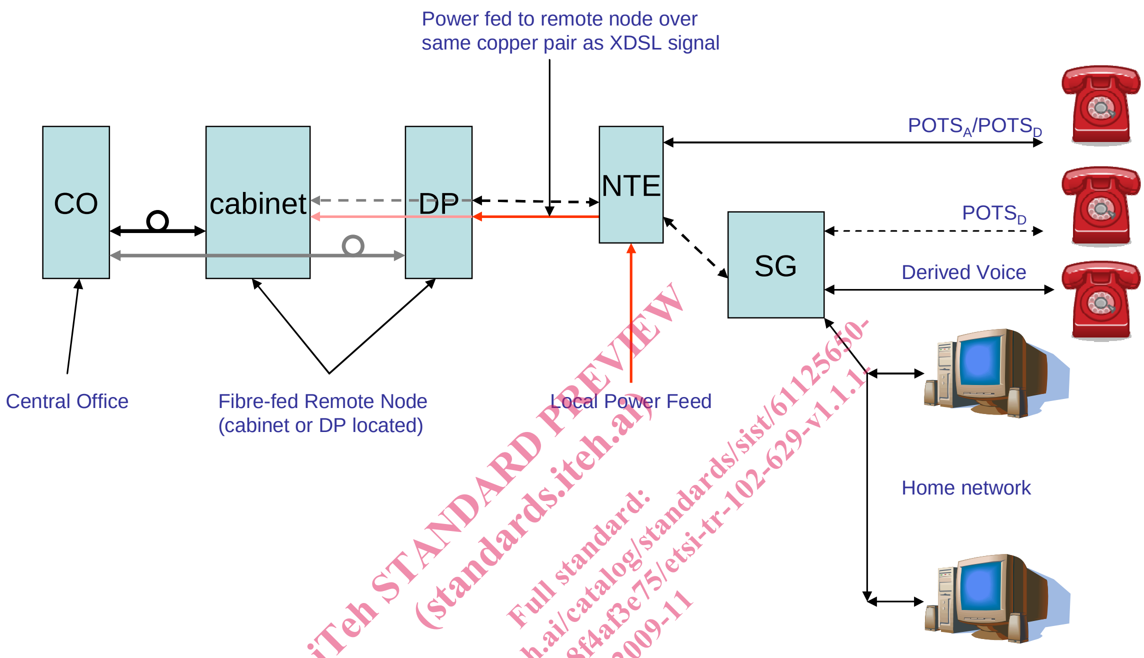

Figure 1: Generic Reverse Power Feed Architecture

Figure 1 shows power being injected at the NTE from a local power source (located within the home/building) which traverses the local loop to power a fibre-fed remote node which can be located at either the DP or cabinet using the same copper pair cable that is used to transmit the xDSL to/from the home/fibre-fed remote node. A metallic POTS service is shown both with an analogue presentation (POTSA) at the NTE and also as a derived POTS service (POTSD). Voice services can also be implemented as a derived service from the service gateway (SG).

An issue with regards to reverse powered fibre-fed nodes is that of whom/what is responsible for the powering of common circuitry contained within the node. It is easy to envisage that an individual user could be responsible for the powering of the remote line terminating/driver electronics corresponding to their particular circuit (see note). However, it is not so easy to determine who/what is responsible for powering of say the ONU that terminates the fibre link.

NOTE: In practice even this may not be easy to implement since DSL chipsets may be of an octal channel design and therefore all eight channels will be required to be powered in order to operate a single channel.

There may be occasions where only a single user is providing power to the remote node but this may not be sufficient to power all of the remote node electronics for proper operation. Also, there may be occasions where say a GPON feed requests a response from the ONU (for ranging or management purposes) when no users are currently connected and providing electrical power.

Such situations result in the requirement for battery back-up devices and these may be located in the SG, remote node itself or the cabinet providing that spare copper-pairs remain connected to the fibre-fed remote node. Figure 2 shows battery backup devices have been located in the NTE and fibre-fed remote node. It is envisaged that in order to provide high-reliability services (including lifeline POTS support) then a combination of battery back-up devices will be distributed throughout the network.

4.2 Power Backup Situations

4.2.1 Case 1 Battery Backup at the NTE

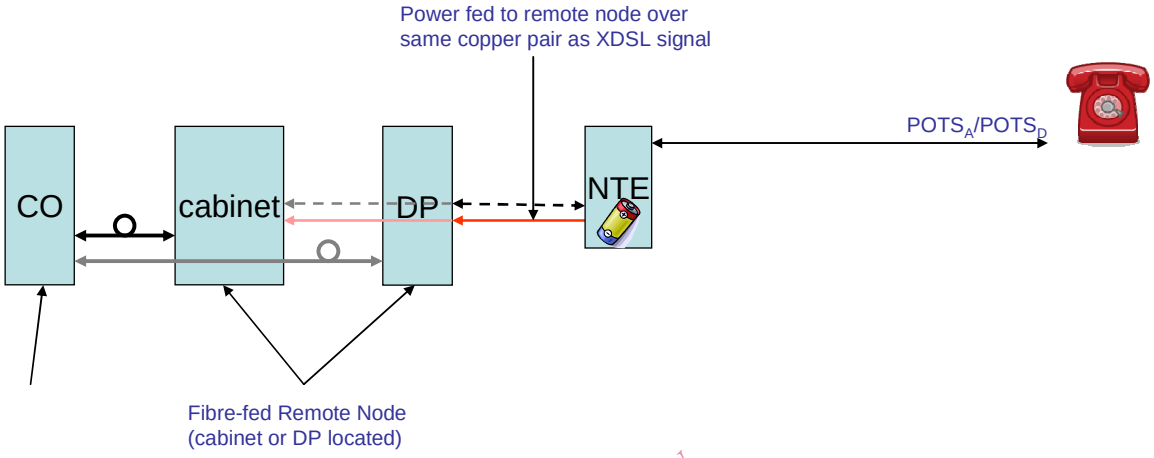

Figure 2: Battery Backup at NTE

Figure 2 shows the case where battery backup is placed at the NTE. The aim being that if there is a local power failure then lifeline POTSA (or maybe POTSD) plus OAM support at the remote node can be provided by the battery backup.

4.2.2 Case 2 Battery Backup at the DP and NTE

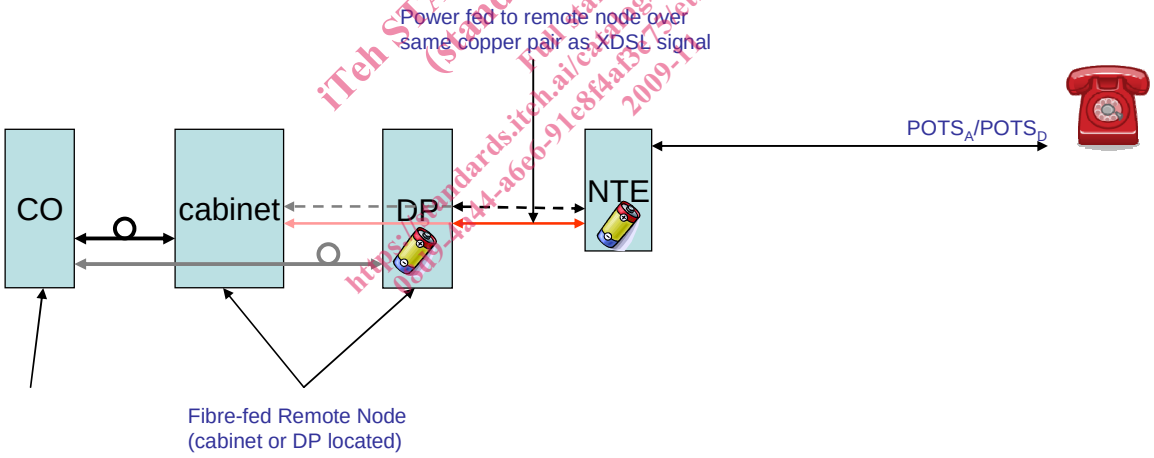

Figure 3: Battery Backup at the DP and NTE

Figure 3 shows the addition of another battery backup located at the DP. This gives the advantage in that equipment located at the DP can remain powered even though no subscribers are connected and thus retaining OAM support.

4.2.3 Case 3 Battery Backup at the DP Only

Figure 4 shows the battery backup being located only at the DP. This arrangement takes away the responsibility for backup from the subscriber - but probably means in practice that a larger capacity backup device is required when compared to Case 2.

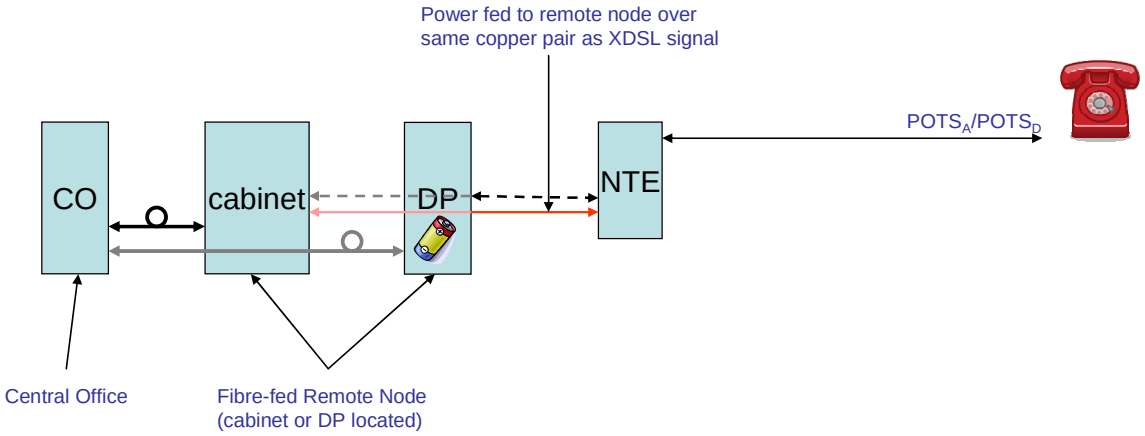

Figure 4: Battery Back-up at the DP

4.2.4 Case 4 Battery Backup at the DP and Cabinet

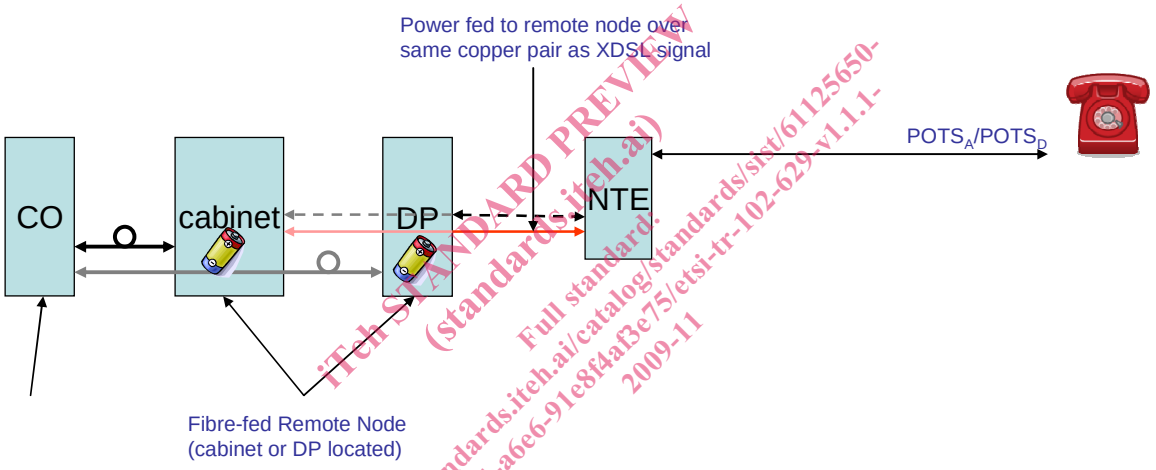

Figure 5: Battery Backup at the DP and Cabinet

Figure 5 shows the battery backup being located at the cabinet and the DP. This arrangement allows a smaller battery to be located at the DP. The battery at the cabinet could be reverse power charged from the DPs.

4.2.5 Case 5 Battery Backup at the DP and Cabinet with Forwards Powering from the CO

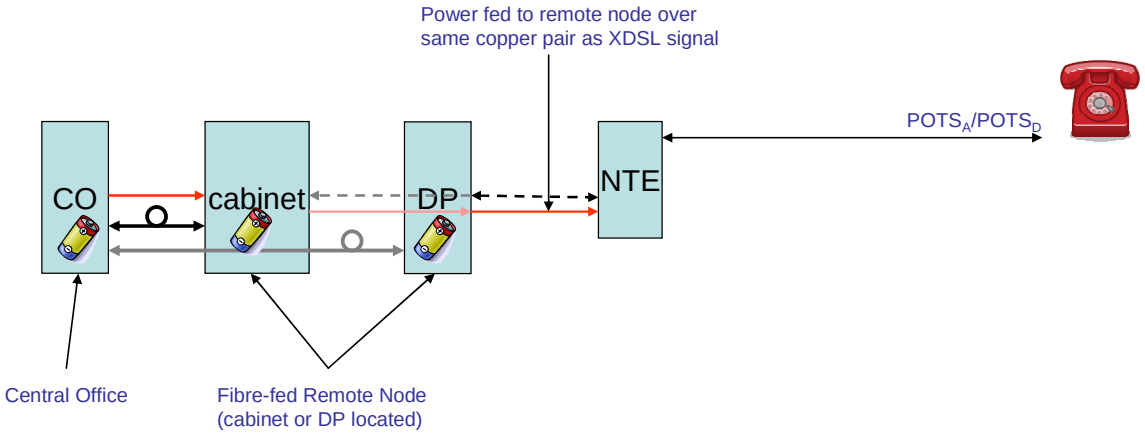

Figure 6: Forwards Powering from the CO