

SUSTAINABILITY COMPARISON BETWEEN THE ACCESS NETWORK TECHNOLOGIES FTTC AND FTTH

EXECUTIVE SUMMARY

The following expert assessment by Prof. Dr. -Ing. Kristof Obermann from the University of Applied Sciences (Technische Hochschule) Mittelhessen was commissioned by the German Broadband Association BREKO.

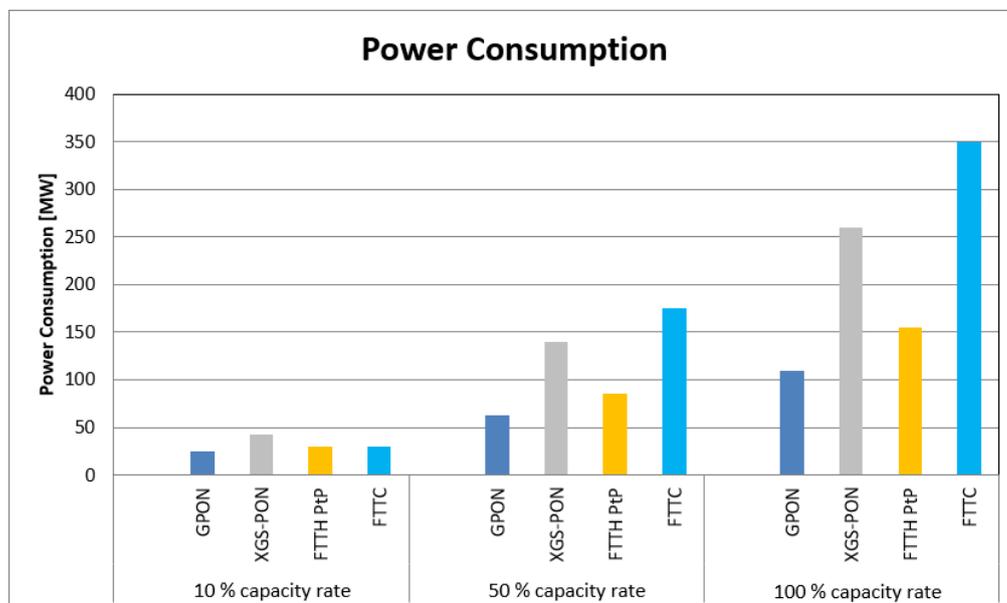
13th May 2020

The objective of the assessment is to examine the sustainability of the access network technologies FTTC (VDSL2 Vectoring, Super Vectoring) and FTTH (GPON and Point-to-Point). For this purpose, electricity demand and weight of the system technology were determined for the following scenarios (in Germany): nationwide supply, urban areas, rural areas, and exemplarily the semi-urban area Haltern am See with real data from the telecommunications network in this area.

Weight can serve as an indicator for the resources needed during production and disposal. Different capacity rates were used for the parameters electricity demand and weight, both in absolute terms and in relation to the marketed bit rate of the respective technology.

The results stipulated that the examined FTTH technologies are more sustainable than FTTC networks in every scenario and for almost every capacity rate. They are more favourable both in terms of power consumption and total weight, despite rather optimistic assumptions for FTTC and very conservative assumptions for FTTH.

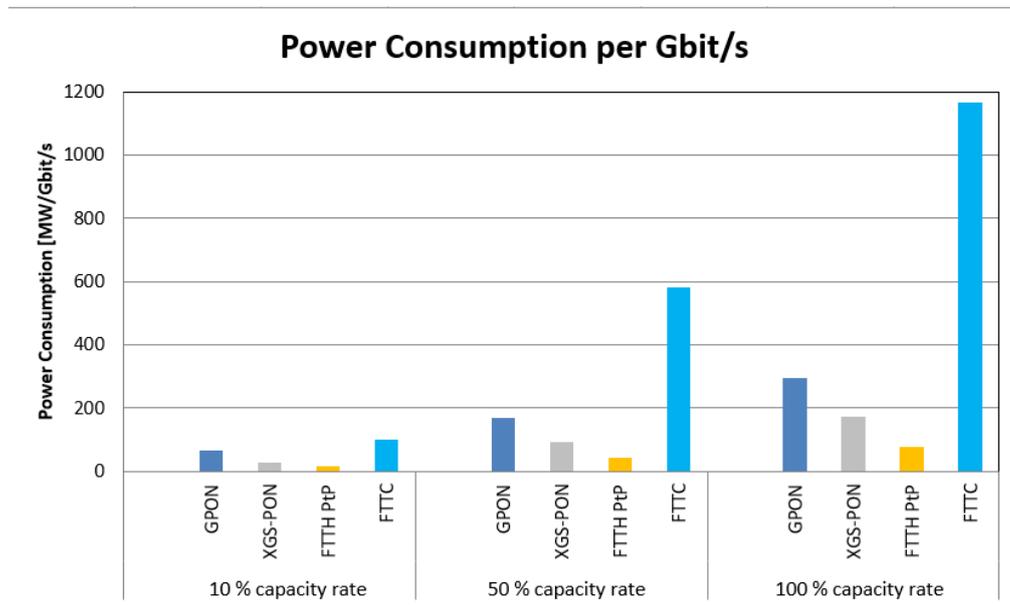
The figure below gives an example of the total electricity consumption of access networks required for nationwide supply with the corresponding technology at different capacity rates:



While GPON provides cluster bit rates of 2.5 Gbit/s downstream and 1.25 Gbit/s upstream, XGS-PON can achieve cluster bit rates of 10 Gbit/s symmetrically. FTTH PtP refers to FTTH point-to-point networks.

It becomes evident that GPON is the best FTTH network in terms of sustainability, followed by FTTH point-to-point and XGS-PON. If all households in Germany were supplied (given a 100 % capacity rate) with GPON, this could save almost 240 MW compared to FTTC.

However, when power consumption and weight are considered relative to the bit rate, FTTH point-to-point and XGS-PON are the best FTTH technologies, as the following figure illustrates:



Based on a sum data rate of one Gbit/s, a full supply of FTTH point-to-point systems can save almost 1100 MW in power and 48,000 t in weight compared to FTTC.

For comparison: typical coal-fired power plant units reach electric capacities between 100 MW and 1000 MW.

Similar results are obtained for urban and rural areas, as well as for the exemplary town Haltern am See. Furthermore, the investigation revealed that above a certain capacity rate the power consumption and the weight of the network elements at the subscriber (CPE or NT) account for the main share of the total power consumption or weight. Consequently, optimisation of the NT has the greatest leverage in terms of power consumption and total weight of access networks.

Against this backdrop, it would be important to implement sleep modes, whereby the power consumption of the CPE is dynamically reduced when the subscriber is inactive. Although such mechanisms are technically possible for FTTC and have been standardised for many years, they lead to instability in the access network due to crosstalk and are therefore not used by network operators in practice. Sleep modes for FTTH are technically possible, but are not yet implemented, although they do not lead to instabilities in the access network. Consequently, there is potential to optimise the power consumption of FTTH technologies even further.