

LOW LOSS MICRO GRID

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ABSTRACT

The need for electrical power is expanding in emerging markets, especially for power to telecommunication and internet connections. A common solution to providing power in a non-electrified area or in areas where power interruptions are common, is to use diesel generator sets located at the communication site.

With the low loss micro grid concept, electrical power is distributed from a strategic location, where cost-effective power can be purchased or produced, and distributed to several receiving places.

A main purpose of this micro grid is to reduce internal losses in the system. Therefore amorphous transformers are used.

KEYWORDS

Remote Power; RBS; optical cable, smart grid.

INTRODUCTION

These stations give the possibility to reduce power and use energy sources with lower environmental impact. The purpose is to localize the feeding stations where we can produce electricity with a low environmental impact or be connected to the grid. The main markets are places without an electrical grid or where the grid has many power interruptions. This gives that it also needs to be a backup source beside the grid connection. The first introduced systems were based on conventional transformers. Due to normally low load need, the transformer losses in the micro power grid became substantial. Therefore low load losses have to be reduced. The last years it has become more common to make transformers with amorphous cores. This is mainly due to the facts that amorphous material has become better and the size of cores gets about the same size as with standard material, and therefore the extra material cost is acceptable and often paid by reduced losses under a short period.

To reduce the losses in the micro grid even more, the main station sends information if it's too heavily loaded in 2 levels. This gives the possibility to prioritize the loads in 3 levels.

POWERING RADIO BASED TELECOM SITES

A radio base station (RBS) needs power feeding during most of the day. The power consumption is dependent upon the size and the required amount of cooling of the shelter. Since the expansion of mobile networks today often occur in areas where electric mains are not present, the power must be produced locally, at the radio base

station.

The most common solution in such a case is to place an electrical power generator at the radio base station, normally consisting of two 7.5 - 15 kVA diesel generators together with a diesel tank. To secure reliable power to the radio base station, a battery bank of lead batteries is used as backup in case of power interruptions.

For a typical radio base station, the consumption cycle peaks during a few hours a day when the number of cell phone users are high, which means that the generators normally are running with a rather small load most of the day.

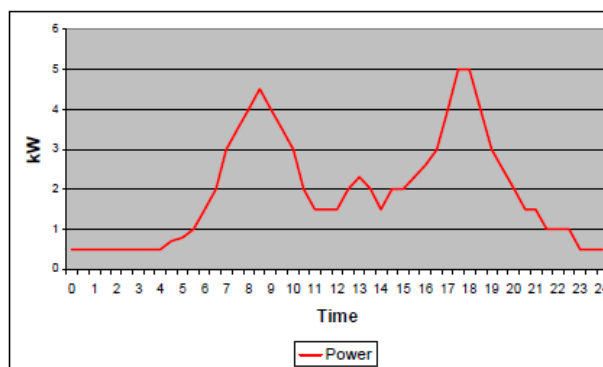


Fig.1: Example of the power consumption for a radio base station site during one day

For a standard generator of 7.5 kVA, the efficiency is typically 30 % but often as low as 10 % when the power load is small. The characteristic of the generators and the power consumption cycles generate large energy costs and huge emissions from fossil fuels.

When using small diesel generators, the annual diesel consumption is typically 15 - 25 m³ for a standard site, where the average power consumption is a few kW.

Another problem is when the engine is running at this low load, the carbon accumulation becomes very high, and therefore also the service costs for the engine becomes high.

Power maintenance

Since the power is produced locally at the site, all the maintenance must be made at the site. The result is that operational and maintenance costs become a considerable part of the total power related costs for a network outside the power grid.

Diesel tanks need to be refilled at least every second week on average. The sites are often located in areas that are difficult to access, resulting in large diesel deliverance costs and demanding fuel transports. A recurring maintenance of diesel generators becomes vital to guarantee reliable power to the radio base station. The life time of smaller diesel generators is comparatively short.