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The changing world of standby batteries in telecoms applications

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Abstract

This paper considers three areas of activity that are directly affecting utilisation of standby batteries in european telecom applications. (1) Cell-phone licences agreements, (2) changes in centralised power and (3) harmonisation of standards. *Cell-phone licence agreements*: The change from Utopian optimism to concern and restraint has been well documented in the financial press. The paper will outline recent proposals from the Telecom Industry to resolve these problems, and will suggest possible implications to the future supply of VRLA Standby Power Batteries. *Changes in centralised power*: For many years now there has been a transfer of battery electrical capacity from Centralised Standby Power Batteries to ''New Technology'' batteries. This has arisen from the simple fact that power cannot be transferred to 'End User connected equipment' by means of 'wireless' or 'optical fibre' transmission. In addition, and more recently, the concept has been introduced that as modern network switches are in fact computers, they should be powered as computers, which has brought about the introduction of standard UPS power in contrast to the traditional low voltage dc power. Both these issues are explored to indicate the possible effects upon VRLA Centralised Power. *Harmonisation of standards*: In order to eliminate 'restrictions to trade' within the European region, harmonisation of industrial standards has been for many years a central platform of European legislation. However, in reality, the application of this concept to Telecoms Standby Power batteries has not been so successful, arising largely because it has been difficult to harmonise the requirements of users. These problems are now being addressed, and this paper will provide an update on recent standards development for VRLA Standby Power Batteries.

Keywords: Telecommunications power; Lead-acid; Standby batteries; VRLA; Cell-phones; Infrastructures sharing; Power systems; International standards

1. Introduction

During the first half year of 2001, the Telephone Industry experienced what can only be described as Utopian business optimism, which was the forerunner to the highly competitive ''auction'' of cell-phone licences. The outcome of this activity was that between 4 and 5 licences were allocated in most European countries at extremely high prices. However, for reasons that have been well documented in the financial press, the aurora of optimism has given way to caution and restraint. As a consequence, in what can only be described as a fluid situation, the objective of this paper is to identify a few technical features that could affect battery standby power applications when the business climate has stabilised.

2. Life after the recent sale of cell-phone licences

Operators who have acquired the licence agreements did so by increasing their borrowings to unprecedented high levels, thus putting a squeeze on the availability of capital to fund the infrastructures needed to support the new operating licences. Such is the intensity of the situation, that according to the financial press, merging of European Telephone Operators (unthinkable in the past) may occur in the near future. Whilst this in itself could have a marked effect upon the future supply of standby batteries, some operators [1] in Europe are already considering sharing infrastructure in order to reduce capital investment.

Many options for infrastructure sharing are being considered. And those related to the supply of standby power can be summarised as follows:

- Build a single network for more than one operator.
- Sharing towers and sites.
- Sharing transmission.

In general, the requirements for standby power are directly related to the communication traffic requirement of the installation. In such circumstances, from a battery viewpoint, it could be argued that whilst there is no demand for technical change, the business prospects are as usual volume related.

But is this necessarily true if operators were to share facilities? Fig. 1 shows an ideal theoretical cell-phone network. It is ideal in the sense that a cell-phone working within such a network area (ABCD) would detect little difference in signal strength, a feature not necessary with current systems.

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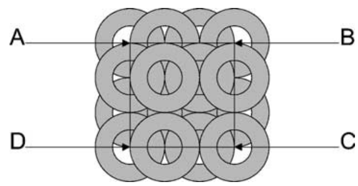

Fig. 1. Ideal 16 cell network.

Such an ideal system is far more desirable for the new generation of cell-phone networks however, and if several operators were to share and fund the same networks, then such a system becomes feasible, with a reduction in costs to the participating members.

In this case, if the quantitative relationship between communication traffic and battery standby power remains the same, then the prospects for battery power will not be impaired. However, a closer look at the network area (ABCD) will indicate that in the event of the failure of one cell site, there is not going to be a significant loss of signal strength.

This is shown in Fig. 2 where point E represents the centre of a cell site that has gone out of service. This kind of scenario gives the operators the opportunity to 'risk asses' their requirements for standby power autonomy.

- Is it really necessary to maintain the same level of autonomy time, or could it be reduced?

Or

- Is it necessary to install standby power at all cell sites?

It can be concluded therefore, that whilst the battery technology will remain unaffected, if infrastructure sharing between operators becomes a reality, it is likely that battery standby power installed into future networks may not be at the same levels as has been the case in the past.

2.1. Implications and changes to centralised power

For many years now there has been a transfer of battery electrical capacity from centralised power batteries to 'new technology' batteries. This has arisen from the simple fact that electrical power cannot be transferred to 'End user connected equipment' by means of 'wireless' or 'optical fibre' transmission.

In parallel with these changes, and starting in the 1980s, telephone exchange battery standby started to decentralise. This in effect amounted to repackaging battery power, from large batteries in battery rooms, to much smaller batteries

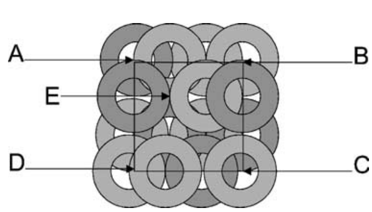

Fig. 2. Ideal cell network with one cell site out of operation.

directly located with the sets of network switching. From an operational view point it was this change in direction that brought about the need for, and the development of the VRLA technology.

2.1.1. Developments in new generation cell-phone architecture

Similar changes in standby power requirements are now are now being considered for the future cell-phone networks. Operators introducing the new generation networks are likely to use multi-layered [1] architecture based on 'Macrocells' 'Microcells' and 'Picocells'.

The allocation and use of these cells depends upon whether the operational environment is within buildings, in the street, or in the urban or rural area. The concept is illustrate in Fig. 3.

2.1.1.1. Macrocells. These cells already exist, and are associated with roof top or tower mounted antennae. They cover a variety of terrain types and support fast moving vehicles. They will continue to use battery power based predominantly on VRLA technology. However, battery size will be subject to many factors such as autonomy time and the nature of the required 'back up' power.

2.1.1.2. Microcells. Microcells take the form of street furniture, and are used in metropolitan areas. They will be typically located at 100 m intervals throughout city centres and are used in conjunction with macrocells to manage traffic load and performance. Again, in temperate climates the VRLA technology has been very successful in this application and there is no known reason why this should not continue.

2.1.1.3. Public picocells. Picocells are used for very high capacity 'hot spots' where people congregate. They planned independently from the micro/macro layer, with typical examples being, railway stations, airports, conference centres, sports arenas, shopping malls, etc. The requirements

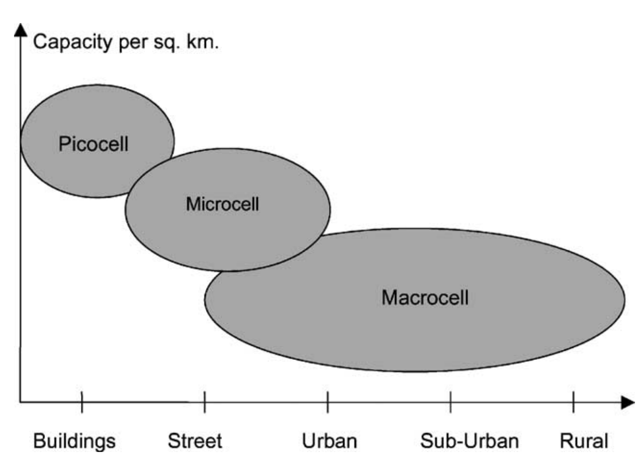

Fig. 3. Multi-layer cell-phone applications.

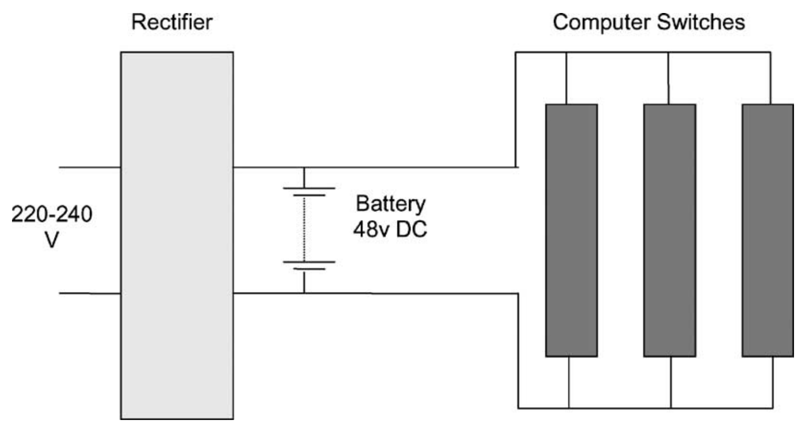

Fig. 4. Traditional low voltage dc telecommunications power system.

for standby power would be ideal for VRLA batteries, but further projections are to the least speculative.

2.2. The ac or dc standby power

This may appear to be a contradiction in terms so far as telecommunications power is concerned, but more recently, the concept has been introduced, that as modern network switches are in fact computers, why should they not be powered as computers. This in turn has brought about the introduction of 'UPS' power in contrast to the traditional low voltage dc power normally used for telecommunications power. In what way does this affect battery standby power? The situation can best be explained by reference to the simple diagrams shown in Figs. 4 and 5.

Fig. 4 shows the traditional low voltage dc telecommunication standby power system. The battery standby power operates at dc voltages between 48 and 60 V and the batteries used may be distributed power VRLA batteries or centralised battery room vented types.

In contrast Fig. 5. shows the computer switch operated at 220/240 V ac. In this case the standby power is a typical UPS with a nominal 220 V dc battery floating between the rectifier and the inverter.

The attraction of this alternative system has been flexibility, availability, and cost. From a battery point of view, in terms of the power required, there will be no real difference between either of the systems. However, whilst VRLA batteries will dominate this type of application, the type of VRLA used and its configuration will probably be quite different.

At this point it should be noted that 'force of circumstances' have brought about the potential use of UPS/ac powered computer switches, and it cannot be assumed that the precedent has been set for a universal transition. It is understood for instance, that there are alternative views from telecom power engineers [2] about the use of UPS/ac power systems, and of course the land line network will still require the low voltage dc power.

2.3. Harmonisation of standards

In order to eliminate 'restrictions to trade' within the European region, harmonisation of industrial standards has

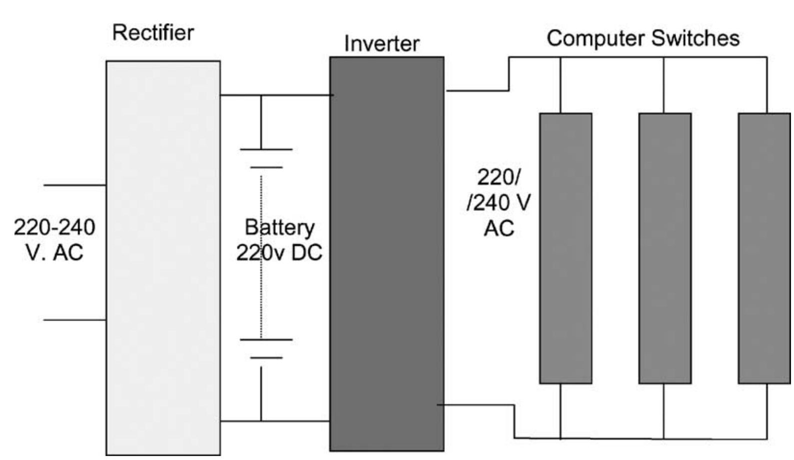

Fig. 5. UPS/ac computer switch power system.

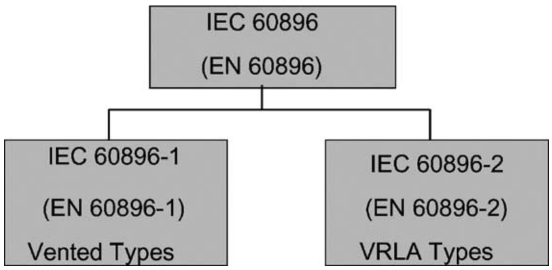

Fig. 6. IEC/EN standards for lead-acid stationary batteries.

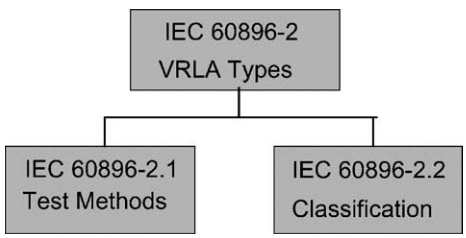

Fig. 7. Proposed structure for VRLA stationary standards.

been for many years a central platform of European legislation. In the case of standby power batteries (Stationary Types), the first standard [3] for vented types was published in 1987, followed by a standard [4] for valve regulated types in 1995. These standards were initially published at international level (IEC) and shortly afterwards the same standards were adopted in Europe (EN). This information is shown in Fig. 6.

Subsequently however, the application of this concept to Telecommunication standby power batteries has not been so successful. This has arisen largely because it has been difficult to harmonise the requirements of users.

As a consequence the decision was made in April 2000, at international level (IEC) to review and re-structure the standards for VRLA types. Following considerable discussion and review the proposed structure for the revised standards has been agreed and this is shown above in Fig. 7.

The concept is that the development of the standard for 'Test Methods' is driven by the battery manufacturers, and the standard for 'Classification' is produced by the users. In this particular case the users are represented by the both operators and the original equipment manufacturers.

An overview of this work was given by Giess and Kniveton [5] at the last Intelec conference in October 2001. Subsequently, further work has taken place, with the completion and circulation of a voting draft for the 'Test Methods' standard, and a draft for comment for the 'Classification' standard. Provided that the circulated drafts achieve a reasonable measure of agreement from the National Committees, then it would be reasonable to expect publication of the standards to take place during the next 12 months.

Should this be achieved, then there is the prospect to the battery manufactures of a reduction in costly test programmes, with the added benefit of a larger unified market. To the users of course, there would be cost benefits in procurement appraisal programmes, and a wider range of battery sources.

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