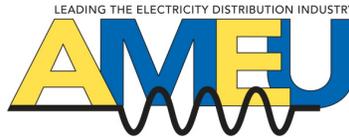


THE EVOLUTION OF PRE-PAID METERING AND LOAD CONTROL SYSTEMS



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INTRODUCTION

Pre-paid electricity metering systems have a 20-year history in South Africa and centralised load management, in the guise of so-called “ripple control systems”, much longer than that. Both technologies have been extremely successful over the years in their respective domains, but the world is constantly moving on and the whole global energy scenario today looks vastly different from what it did even ten years ago.

We’ve seen the global energy crisis driving up costs across the board, there’s been a growing recognition that many of the planet’s resources that we’ve come to depend upon absolutely are non-renewable and environmental expectations and so-called carbon-footprint awareness are becoming ever more pressing by the day. And here at home in South Africa, of course, we have fairly recently woken up to the fact that we, as a result of our own special circumstances, have some additional energy capacity constraints to contend with.

So where does all this leave our old friends “prepaid” and “ripple”? Let’s start our journey by looking at the NEEDS of the various stakeholders. And we’ll start with ...

THE CONSUMER’S NEEDS

Yes, a little unfashionable perhaps, but we’re very deliberately going to discuss the consumer’s needs BEFORE mentioning the utility’s needs, in order to emphasize the global sea-change that is simultaneously occurring in perceptions of citizen’s rights. This movement started a good while ago in the so-called Developed Countries, but is slowly yet surely becoming a significant factor on the socio-political landscape of the Developing World as we experience it today.

Here in South Africa, *Batho Pele*, which is a Sotho expression meaning 'People First', is a very serious government initiative to get public servants to be service orientated, to strive for excellence in service delivery and to commit to continuous service delivery improvement.

And individually, people want to feel that they are getting a fair deal and being treated with respect. The recent violent service delivery protests in various parts of the country should serve as a reminder to us, if indeed any is needed, of the strength and depth of people's feelings on these matters.

So, what does our 21st-Century electricity consumer need from us? And here I want to stress, up front, that whatever the answer to this question, the solutions clearly have to be achievable with minimum inconvenience and lifestyle disturbance.

- First and foremost, consumers need to be able to manage their energy costs and, more specifically, the cost of the electricity they and their families consume. This means that they need to be able to SEE in real time and, above all in an easily understandable way, how their electricity is being consumed - which appliances use the most electricity and which use very little.
- Then they need to be able to CONTROL their electricity consumption patterns in order to minimise costs. Sounds easy? Yes and No – remember what we said earlier about convenience?

Next, let's spend some time looking at ...

THE UTILITY'S NEEDS

Utilities, not surprisingly, have rather different needs from their customers. We'll look at their specific technical needs in a moment, but, in the prevailing spirit of *Batho Pele*, let's first mention one or two of the softer issues:

- At the end of the day, the modern utility supplier needs to have its customers on its side. The days are gone (or very soon will be) when a *take-it-or-leave-it* attitude is acceptable. Effective marketing campaigns, promoting an image of innovation, being perceived as employing the latest technologies for the benefit of the CONSUMER ... these are vital components in the all-important public relations roadshow.
- Another of these *touchy feely* subjects is the question of access to consumer's premises. For various reasons this has become more and more difficult over the years and its not going to get easier any time soon – we really do need to evolve metering and load management solutions that require a bare minimum of utility-owned equipment to be installed on the consumer's premises.

From a financial perspective:

- As always, there's a constant need to keep down the cost of the solutions we implement. Here we really need to be talking "overall solution costs" - cradle-to-grave - and not just the spot price of an individual meter or load switch or one-year's software licensing fee.
- The preservation of investment is a very important requirement – we mentioned at the outset that utilities have been investing in prepaid metering and load management systems for many years now and while some of this older equipment has reached the end of its economic life and is due for replacement, it is essential that this be done in an economically sustainable fashion. New systems and equipment must be specified to be (at the very least) able to coexist with the old and preferably to be fully backward-compatible. This applies to metering equipment, load (ripple) control units AND to the supporting back-office infrastructure.

And now, at last, to some REAL technical requirements (at least, from an engineer's perspective):

- An obvious need is that a utility needs to be able to MANAGE its loads: firstly, on a recurring/cyclic basis to ensure optimal utilisation of plant and to be able to derive best value from wholesale tariff structures which are inevitably based on maximum demand.

- And secondly, because reserve capacity is (and will continue to be) under pressure, there will be an ongoing need to be able to reduce load on an *ad hoc* basis whenever emergency conditions prevail.
- Last, but most certainly not least, there is an urgent need for help in the fight against Energy Theft. You've all heard the figures – electricity theft in South Africa is variously estimated at between 10 and 15 GWh per annum. This is totally unsustainable and MUST be vigorously tackled at all levels, not least at the meter.

STANDARDISATION

Nowadays, standardisation plays a very significant role in determining how technologies evolve. The importance of international collaboration on open global standards can be summarised in terms of the following:

- **Coexistence:** our equipment is going to have to co-exist comfortably with a plethora of multi-part consumer-purchased equipment in the domestic environment. Home automation and personal energy management are just two of the buzz phrases that we'll be hearing a lot more of in the future. Already taking off in the United States and in Europe – it won't be long before these products are ubiquitous here in South Africa.
- **Compatibility:** with existing investment - we mentioned this important requirement a little earlier. Assuring compatibility between old and new requires the relevant framework for standardisation to be in place.
- **Interoperability:** AMM systems of the future will inevitably comprise components from multiple sources and it is clear that these all need to operate together, synergistically, in order for the overall system to function successfully.
- **Conformance Assurance:** this is actually slightly different from the process of standardisation itself, but none the less important in its role in aiding the successful integration of large (or not so large) complex systems.

Two additional drivers for standardisation in these areas are:

- the very important legal framework for our activities - especially when we're talking about such sensitive issues as load management (under exactly what circumstances may you interrupt supply to a consumer?), metrology and revenue management – is very much easier to set up (and maintain) with the relevant standards firmly in place.
- and a related topic: the consumer's right to equal treatment. DME regulations published in September 2008 require categories of domestic consumers to be treated differently, depending on their level of monthly consumption. There's a debate (we won't go into it here) as to exactly what "equality" means in this context, but whichever way it pans out, standards form a crucial element in ensuring that fairness can prevail.

Whilst on the topic of standardisation, how will the technical developments that we're talking about affect, or be affected by, the Standard Transfer Specification as it stands and any enhancements to it? My own view (and I hasten to add that this is my personal opinion and does not necessarily align with that of the board of directors of the STS Association, nor of the STS Association as a whole) is that developments will be driven by the needs of the industry in such a way as to remain fully compatible with the STS as it stands. The speed with which the Standard Transfer Specification evolves formally to keep up with, and support, these developments will depend entirely on the amount of effort that our industry as a whole (not only the manufacturers, but the users as well) is prepared to commit to this task. Standardisation is not cheap – we all stand to benefit by it and we should all share the responsibility of ensuring that the work is done timeously.

TECHNOLOGY & SOLUTIONS

So, we've looked at some of the drivers in our present situation – what new and improved prepaid and load management technologies and solutions can we expect to see emerging over the next couple of years?

Firstly, AMI, STS (conventional prepaid) and LMS technologies are already converging into utility-defined advanced multipart systems, and this trend will most certainly continue in the future. Here at home we've recently seen the publication of NRS049 which includes requirements for all three of these elements.

Multipart systems, starting with the simple "split meter", have been around for several years now and, even in their most basic form, are becoming increasingly popular for their proven abilities in countering the challenge of electricity theft. An important feature, in the light of something we said earlier, is that these systems eliminate the need for "home invasions" for auditing purposes. Advanced multipart metering systems, with upstream communications abilities, are starting to appear in the field and the fact that the IEC has mandated the development of standards for multipart systems (IEC62055-32) is indicative of a significant interest and awareness in the marketplace.

Generally, when we talk about AMI and the future of smart metering systems, we automatically take bi-directional communication (between back-office and meter) as a given. This is certainly true in the case of full-blown AMI "smart metering systems", but not necessarily so in some simpler scenarios. It is quite feasible to add some extremely useful "advanced" functionality to a simple (unidirectional) prepaid system without the expense and complication of adding a back-channel communications infrastructure. Some of our local Metros have recently been doing some very interesting work in drawing up preliminary specifications for just such a system and I believe we can expect to see some significant developments in this area in the months ahead.

The concept of subscribed service levels may be worthy of consideration. Here the consumer chooses what level of service he wants and can afford to pay for. As an example (there are many possible variations on this theme) a premium ("always-on") tariff would be more expensive than a standard (subject to load shedding during emergencies) tariff which, in turn, would be more expensive than a basic tariff (subject to a regular load reduction program, in addition to emergency load shedding).

Load Management functionality can be considered in several variations:

- It can be centralised, as in traditional "ripple control" applications for the switching of geysers, street lighting etc. But now that our meters are all microprocessor-based, there's no technical reason why they couldn't also detect and react on these broadcast signals for some additional, more innovative, purposes – think tariff switching, clock synchronisation, etc etc
- Load Management could also be implemented in a distributed fashion where, for example, local area controllers in street kiosks might autonomously control load switches on the consumer's premises, or dynamically adjust the load limit in his meter ...
- Consumer-owned load switches, perhaps available in different categories and paired with the meter or a local area controller, used in conjunction with a subscribed service level scheme as described above, would enable the consumer to adapt his load profile to suit his lifestyle (and his pocket)

The ability for a utility to remotely disconnect / reconnect a consumer is an obvious enhancement to include in any simple AMI system, but another, perhaps less obvious, feature would be the ability to switch the operating mode of a domestic meter from prepaid to credit metering or into "energy limiting mode" – in fact this feature is already available in certain meters available locally.

We briefly mentioned (two-way) communications technologies earlier: these range from non-realtime systems, using physical tokens based on smartcard or RFID technology, to realtime PLC (powerline carrier) technologies using narrow- or broad-band techniques, and of course a whole gamut of rf-based solutions (Zigbee, Bluetooth, Wi-Fi, GPRS). There's work going on, as we speak, in all of these areas and no doubt in the long run some favourites will emerge. There's also a good argument to be made that there's no one-size-fits-all solution and that the ultimate system will require a multiplicity of communication techniques. Right now I would simply urge you to be cautious and bear in mind particularly the coexistence issues that we highlighted earlier.

TRUSTED PARTNERSHIPS

Here's one final suggestion as to something that we're likely to see a lot more of in the next few years. We've seen how complex the challenges are in our industry, we know how sophisticated our utilities have become in their attitudes to their business and I can assure you that our suppliers are just as committed to developing truly innovative and effective solutions for the benefit of all. But how do we bring all of this creative energy together most effectively?

My proposal is that we should be giving serious consideration to the concept of *TRUSTED PARTNERSHIPS* between customers and their suppliers.

What does this concept of a trusted partnership really mean? Is it a pretty euphemism for a monopoly or a lock-in, an excuse for bribery and corruption, or is there something more to it?

What we're talking about is a situation where supplier companies aspire to become reliable collaborators with their clients, so that the clients look to them for advice and dialogue about issues of common concern. Here the focus is less on achieving immediate sales and more on ensuring that a firm's products and services will receive positive consideration when the time comes to make decisions about purchases.

Importantly, this doesn't need to happen in an exclusive, anticompetitive or monopolistic way. The current EDF / ERDF AMM pilot project in France is a good example. Here the customer has teamed up in a trusted partnership with three major meter suppliers and an I.T. facilitator to roll out a 300,000 meter AMM pilot project. The main project rollout, expected to run for a period of five years commencing in 2012, will involve a total of 35 million smart meters, installed at rates of up to 35,000 meters per day! All of the players stand to benefit "materially" from this project and all will undoubtedly gain invaluable experience from their involvement.

CONCLUSION

Traditional load management and prepaid metering systems in South Africa have a long history and considerable investment behind them, but the electrical generation and distribution scenario today looks vastly different from what it did just a few short years ago.

Nowadays consumers have rights (*Batho Pele!*), they need to be able to understand their consumption patterns and control them with minimal impact on their lifestyle.

Utilities, on the other hand, need to be able to effectively manage their loads and reduce opportunities for electricity theft, while keeping total lifecycle costs down, preserving the value of their existing investments and recognising the importance of ongoing standardisation activities.

Likely (in some cases even definite) developments over the next few years include advanced multipart systems with upstream communications ability. Also, low-end AMI systems with a useful array of additional capabilities, but still based on unidirectional upstream communications. The concept of subscribed service levels may very well gain ground, in conjunction with a variety of integrated load management methodologies.

Communications technologies are constantly evolving, but the jury is still out on which will turn out to be optimal in these environments in the long run.

And finally, given the complexity of these challenges, perhaps we need to give serious consideration to the concept, well recognised elsewhere in the world, of trusted partnerships between customers and suppliers.

Thank you for your attention.