11/5/09

Submission to the Department of Broadband, Communications and the Digital Economy regarding the National Broadband Network: Backhaul Blackspots Initiative.

Title: A Twenty First Century National Broadband Network - Use of Twenty First Century Technology

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Introduction

The Australian Government, over the last few number of years, have provided funding to improve Australian telecommunications infrastructure and service availability and in particular to Remote and Regional Australia. Many millions of dollars have been spent bringing telecommunications services to those members of our community who, due to their remoteness or commercial unviability had previously been neglected.

Reliable telecommunications services to Regional and Remote Australia is a high priority. The National Broadband Network is the latest and most ambitious of these telecommunications projects.

The Minister for Broadband, Communications and the Digital Economy, Senator the Hon Stephen Conroy, in his address to the National Press Club on Tuesday, 28th^{h} April, 2009, spoke about the importance of the NBN project, the need for innovation, use of green technology, smart infrastructure and how it can benefit areas such as Health, Education, Productivity and the introduction of Smart Infrastructure.

In previous telecommunications funding exercises it has been left to the winning bidder to select the telecommunications infrastructure equipment to be installed. With the formation of the majority government owned National Broadband Network Company and the planned general Implementation Study the opportunity to specify more efficient and reliable technologies now presents itself.

It is in the area of Power Consumption and Backup Reliability that I wish to address in this submission.

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Background

Telecoms infrastructure equipment, be it the Public Switched Telephone Network (PSTN), Mobiles or Broadband Networks, typically runs off nominal 48V Direct Current (DC) power. Most installations have 240V Alternating Current (AC) mains power coming in which is put through a rectifier which then converts the Alternating Current power to Direct Current (DC) power. There are also a number of Solar powered sites as well that run on a straight nominal 48V DC.

The installed rectifier systems power all the DC telecommunications equipment at the site as well as providing sufficient current to recharge the backup battery system after a power outage. Typically these rectifier systems have an efficiency rating of about 90% or less. The result of this low efficiency is the higher consumption of electricity.

Almost without exception each infrastructure site has a nominal 48V battery as backup should there be a 240V AC mains failure. Battery backup time is dependant on the location and type of the infrastructure site. For Metropolitan areas it is normally 3 or 8 hours depending on the type of site and if there is an attached generator or not. For regional and remote areas it can vary between 3 hours to anything up to 240 hours. Typically it would average between 8 -18 hours. Factors affecting this back up time include distance from the nearest service base, or if the site is located in a Bushfire, Flood or Cyclone prone area. In any event, should there be a 240V mains failure, a telecommunication site's last line of defense is the installed battery backup.

To the uninformed, a battery is a box that electricity or some form of electrical power comes from. In reality it is a box of chemicals which as a result of a chemical reaction inside the box ultimately produces electrical power.

The most commonly used battery within the Telecommunications Industry today is the Valve Regulated Lead Acid battery (VRLA). This type of battery has been used over the last 15-20 years with varying degrees of success. Depending on where it is installed the service life can be anywhere from 1 year (harsh uncontrolled environment) to 6-8 years (controlled Air Conditioned environment).

These types of batteries have some inherent problems due to their design. They can suffer from Sudden Death Failure, Dryout, Thermal Runaway and a number of other failure modes making them unpredictable and unreliable.

Sudden Death Failure would be well known to most motorists whereby one minute the battery will start their car then the next minute it is totally dead with no power at all. An inconvenience to a motorist at the least but when a backup battery fails in an important installation the ramifications can be far more serious.

Telecommunications carriers use the VRLA battery because it is cheap, and supposedly maintenance free. CAPEX budget constraints, in my experience, are a driving force behind their choice of battery.

Air Conditioning is installed at sites where possible. The size of the site will generally determine the size of the air conditioning system. These systems are very power hungry and also require maintenance to ensure continued operation. One carrier advised that the majority of maintenance call outs were for faults with the site air conditioning systems. Why is it needed? Older infrastructure equipment can become erratic at higher operating temperatures and it also provides a constant cooler operating environment for the VRLA backup batteries which have shortened life in temperatures over 25C.

Operational Expenditure (OPEX), in consideration of a major project, seems to be the forgotten cost. I had a comment made to me recently by a second tier telecoms company. They stated that when they bid and win a project the only thing that is of concern to them is the contract price (CAPEX). They have no regard at all for the ongoing OPEX required for the remaining life of the equipment. Equipment is chosen on a CAPEX price basis not Whole of Life Cost.

Due to the unpredictable failure modes of the VRLA battery, systems need to be put in place to closely monitor them. An entire industry has been created in the supply of monitoring and testing equipment. Valuable OPEX budgets are consumed in regular testing and early replacement.

Carriers have different approaches to managing the unpredictable failure of VRLA batteries. Some are pro-active by performing regular testing and have internal standards which mandate a specific Life Cycle Replacement time based on equations applied to the particular site type and Temperature Zone the equipment is located in. Some just replace the batteries after a service life of typically five years (air conditioned site) regardless of remaining capacity. Others are purely re-active only replacing the batteries **AFTER** they have failed.

Why is highly reliable, low maintenance equipment with a long service life not specified at the time of tender?

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Alternative Technologies

Are there alternative reliable and more up to date Battery and DC Rectifier technologies available now? The answer is yes.

Batteries

Advanced energy storage technologies are available now to meet the specific needs of Telecoms Networks. They are more powerful, highly reliable with longer life solutions and enhanced Total Cost of Ownership (TCO). Lead Acid is not the only chemistry used to manufacture batteries. Others such as Nickel Cadmium, Lithium Ion and Nickel Metal Hydride are manufactured with models specifically for Telecoms applications.

What are some of the benefits offered by these alternative battery technologies?

- Maintenance Free.
- 20+ year life
- Field Proven Intrinsic Reliability (No Sudden Death)
- Temperature Resistant - can operate at high temperatures with minimal effect on operating life
- Reduced Energy Consumption - lower carbon footprint
- High Energy Density – Lighter Weight and Reduced Volume
- 19" & 23" Rack mountable
- Integrated 48V 19" Rack Mount 1U or 3U ETSI Format Battery System
- Hot Swappable
- Comprehensive Communication
- Self Diagnostic - State of Charge and State of Health indication
- Sleep Mode (prolonged outages)

DC Rectifier Systems

Modern 21st[t] century rectifiers with smart controllers, inbuilt remote monitoring systems, wider operating temperature ranges and with efficiencies of up to 96.5% are now available to the market. Some carriers are just beginning to use them after realizing the savings in reliability, electricity consumption and carbon footprint.

These are just some of the benefits that can be obtained from using Alternative 21st[t] Century Technologies.

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Conclusion

Minister Conroy in his address to the National Press Club on Tuesday, 28th April, 2009 clearly described why we need a National Broadband Network and the benefits that can be obtained.

The National Broadband Network Company will have a golden opportunity to investigate the benefits of using Alternative Technologies in the areas mentioned above. The NBN should not be constrained by outdated thinking and excessively tight CAPEX budgets. OPEX and Total Cost of Ownership should be fully investigated as part of the tender process.

I respectfully submit that for the reasons as stated that the Backhaul Blackspots Initiative and the wider general Implementation Study for the National Broadband Network properly investigate the Technical and Financial benefits to be obtained in the use of Alternative Battery Technologies and DC Rectifier Systems.

Yours sincerely,

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References: Senator the Hon Stephen Conroy
Minister for Broadband, Communications and the Digital Economy
Address to the National Press Club, Tuesday, 28 April, 2009.

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