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Focus on the kicker, not the keeper

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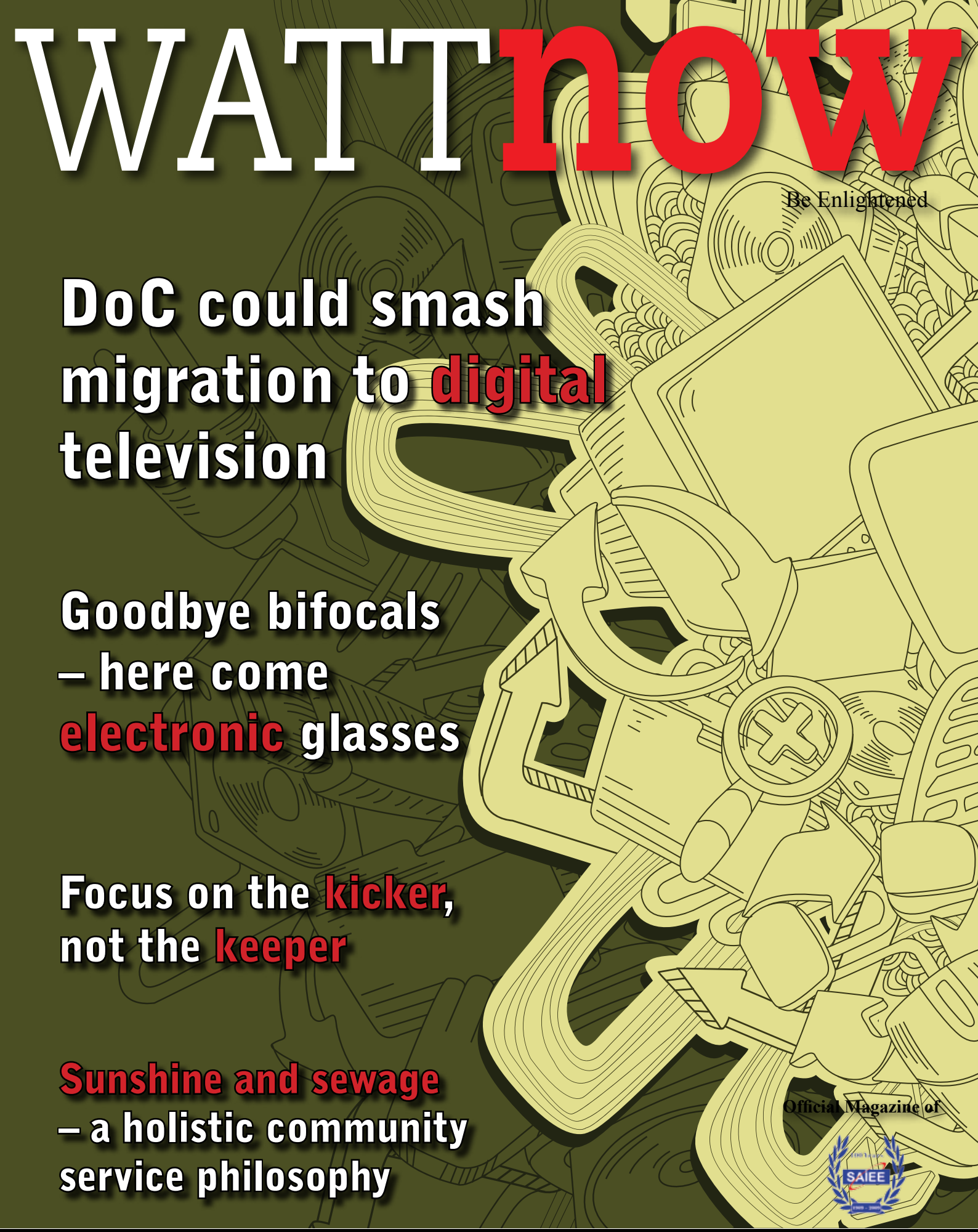

Official Magazine of

SAIEE

June 2010

Final exams are on Monday. What do we do after that?

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Sometimes government should think first and speak afterwards

Sometimes I think that our government representatives speak first and then think afterwards. This seems to be most evident in the latest round of comic suggestions from the Department of Communications that makes a range of outrageous claims that, I believe, are based on little else than hot air.

At least, I hope that's the case.

I am referring to the suggestion that South Africa should adopt a new standard for the digital terrestrial television migration and go for the Japanese and Brazilian variants of ISDB-T instead of the widely used and widely adopted (by South Africa as well) DVB-T standard.

Hundreds of millions of rands have been invested by interested parties (including M-Net, SABC and e.tv) on making sure that the country is ready to make the migration to digital television in November next year in line with its commitments.

The South African Bureau of Standards has developed a local standard for local suppliers. Moreover, Sentech has set up the broadcast infrastructure to carry the signals into the households and Altech UEC (and many other too) have been perfecting the set-top-boxes required to convert the digital signal to an analogue signal so that existing television sets can still be used.

Then, out of the blue, along come various government representatives who start saying that South Africa is reconsidering the standard and might change it in favour of the Japanese and Brazilian ISDB-T variants.

This has got to be the most inane suggestion that has ever come from any government representatives in thelong history of speaking first and thinking afterwards.

And I cannot believe, for one moment, that these government officials are seriously considering changing the standard because if they did so that would be more seriously stupid than anything ever done in the history of the African Nationalist Congress in the last 80 years.

Fortunately I do believe that sense will prevail and all the panic that was created by a few ill-chosen words will quickly be forgotten and simply wash away like soap suds.

What I find particularly intriguing though is how quickly some of the conspiracy theorists leapt onto the bandwagon, suggesting, for instance that there would "be a new power station for South Africa if the Japanese standard was adopted".

Where the evidence for that came from remains a mystery. Why would that be an incentive is a mystery. And how a power stations links to a digital broadcasting standard also remains a mystery.

It just goes to show that you certainly can't always trust what you read these days and implies too (with the proliferation of information via the Internet) that you really need to question the information that is being bandied about on popular Internet news channels.

What is known right now is that South Africa – and the member states of the Southern African Development Community – have adopted the DVB-T standard and will continue to implement it unless government does an about face and wastes all the millions that have already been invested.

What else is known is that there are 120 other countries that are using DVB-T or DVB-T2 (an upgrade within the same standard) and only Japan and Brazil have deployed the ISDB-T standard.

Certainly, government's ill-informed comments about possibly changing the standard did serve to create a degree of panic in the digital television arena and led to a wave of protests from all and sundry, along with pages and pages of well-reasoned submissions pointing out why such a change would be catastrophic.

And it was all a huge waste of time.

Unless, of course, the conspiracy theorists are right, the government representatives are inane and the government goes ahead and changes the standard.

Somehow I doubt that this will happen – but many much wiser people than me have made such dumb predictions.

So let's wait and see.

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5> WATT'S GOING ON?

India's 3G auction raises $15-billion; Skyrove in bid to get 4G licence; The G20 Summit: is it just another disappointment; Novozymes and Ceres partner on biofuel crops; Ugandan Elizabeth Mukasa wins WCIT Award; New solar inverters' 98,4 percent efficiency; 'Pretty' energy efficient bulbs – show us how?







50> SAIEE

What is power cable termination? The SAIEE-UCT Communications and Networking Seminar held at UCT.

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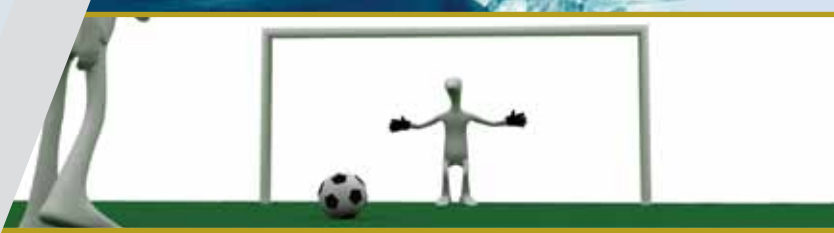

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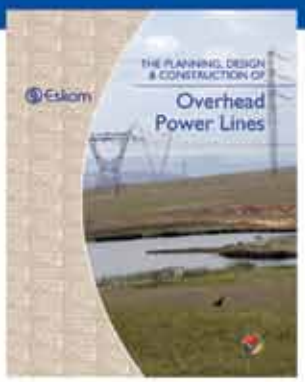

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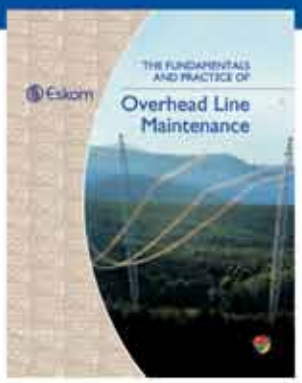

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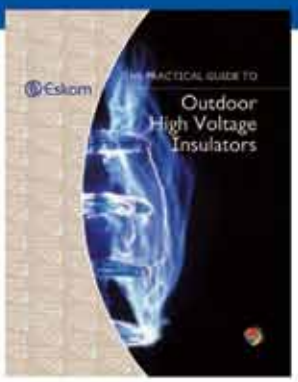

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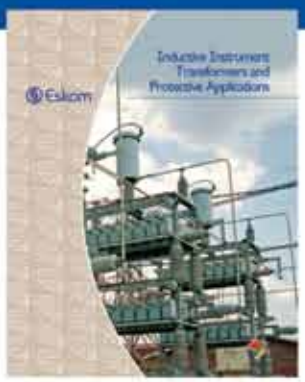

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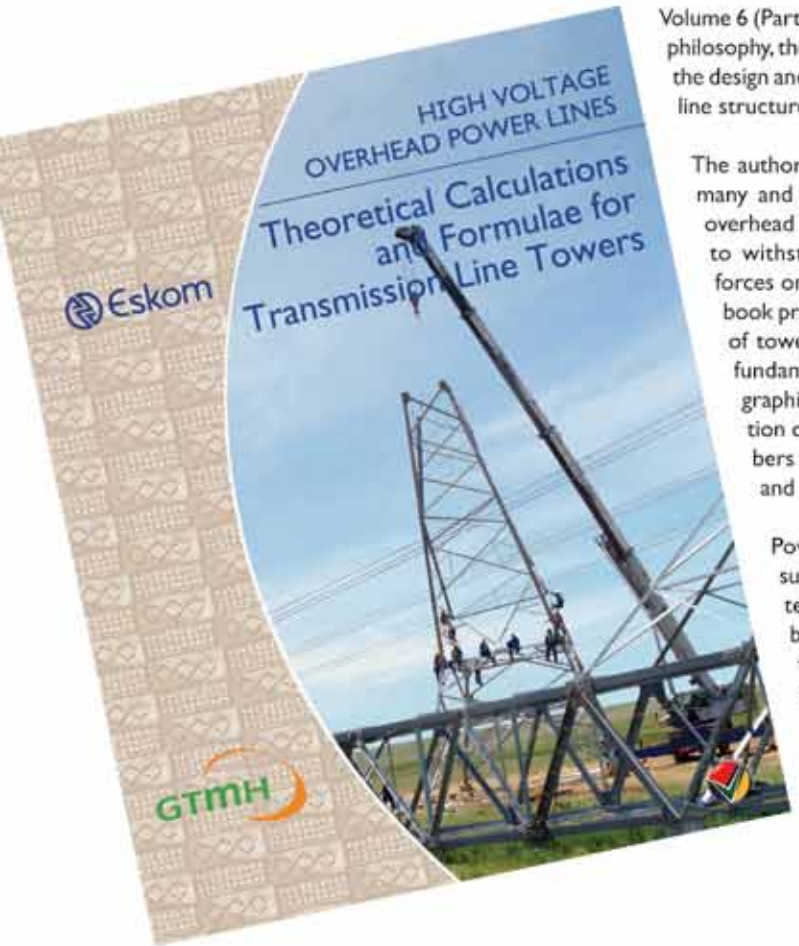

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The author begins with an analysis of the many and varied mechanical forces that overhead power line towers are required to withstand. Once the nature of the forces on the towers is understood, the book proceeds to discuss the geometry of towers. It moves on to discuss the fundamentals of force diagrams and graphical techniques for the calculation of the forces in the tower members and introduces finite elements and computer methods.

Power line towers are routinely subjected to full scale mechanical testing and the book concludes by describing the procedures followed at major test stations around the world.

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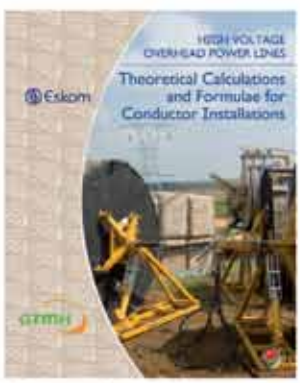

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India's 3G auction raises $15-billion

After 34 days of aggressive bidding, India's 3G auctions raised $15 billion for India's government, nearly double the goal set for both 3G and BWA auctions combined. The 3G auction was for three to four slots of two by 5 MHz spectrum in the 2,1 GHz band. There were several successful bidders with no single operator winning a pan-India licence.

"The auction rules allowed bidders to bid for zonal – as opposed to pan-India strategies – but more significantly, as the intense bidding pushed prices steadily higher, most operators were forced to abandon pan-India dreams and make hard choices.

India will now have six significant 3G service providers with fragmented coverage maps in addition to the state-owned BSNL/MTNL organisation according to Shiv Putcha, principal analyst with Ovum's Emerging Markets practice. Apparently the most aggressive bidders were Bharti and Vodafone with total bids of $2.7 billion and $2.6 billion for 13 and 9 circles respectively.

Among the operators, Bharti and Vodafone won the prize circles of Delhi and Mumbai and this helped them to protect their premium subscriber base and heavy investments. The other metropolitan winner, Reliance, has ensured that they now have the ability to target premium, high value subscribers. Beyond these metropolitan areas, the picture is mixed with circles dispersed among all the winning bidders. The biggest surprise of the auction was the strong bidding from IDEA and Aircel.

Putcha says the Indian mobile sector now faces making a transition from volume to value growth in an intensely competitive environment amid regulatory uncertainty. The fragmented 3G coverage maps will of course, have to be filled in at the next round of auctions in 2014. "The key is to quickly drive revenue growth from 3G services. 3G will provide operators with an opportunity to break out of the vicious circle of price competition with differentiated, data-centric services. The lower cost of providing voice will also help margins and provide capacity relief. Moreover, time to market for 3G services will be shorter than the global norm since networks are mostly 3G-ready and devices have already been pre-seeded in key circles," says Putcha.

Skyrove in bid to get 4G licence

Cape Town WiFi hotspot provider, Skyrove, will bid for the highly contested 2,6 GHz national spectrum radio frequency in an upcoming national auction – the first of its kind in South Africa. The 2,6 GHz radio frequency will be used to build a fourth generation (4G) network and is set to change the face of the mobile landscape by enabling the delivery of high-speed mobile broadband services, including Video-on-Demand and Voice over IP.

Should they win the bid, Skyrove plans to share its infrastructure with other service providers, and Henk Kleynhans, founder of the company, claims that Internet access provision needs to be democratised.

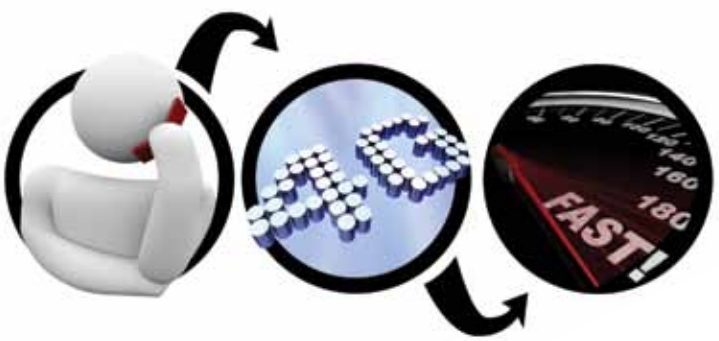
He claims the company plans to build a nationwide mobile broadband network by sharing infrastructure with more than 500 ECS licence holders, enabling them to offer 4G services and injecting much needed liquidity into the mobile broadband market.

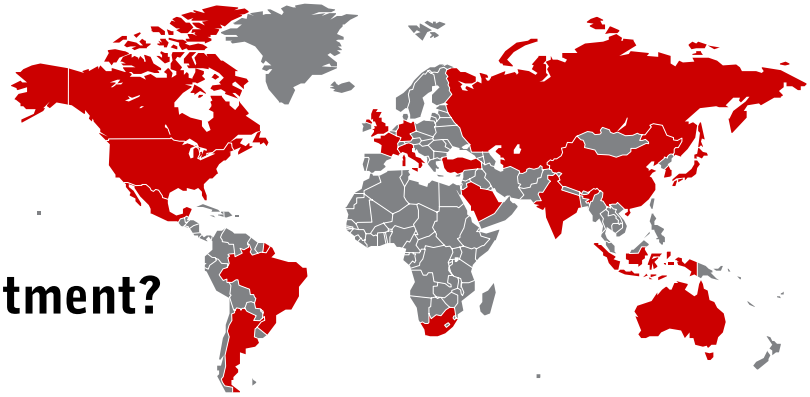
Skyrove's approach to addressing the issue of infrastructure is to sell services directly to established ISPs in bulk and at wholesale prices and will not go into competition against the other telecommunications companies by selling its services directly to consumers.

The company's current business model allows anyone to set up a WiFi hotspot through the Skyrove network and earn an income by sharing Internet access with others. "The principle with the 2,6 GHz national radio frequency spectrum is the same. This is not a David vs Goliath battle, but rather a matter of 500 Davids providing competitive services while a group of giants continue to dominate the market," he claims.

Although this plan does not exclude service to individual consumers, Kleynhans believes that this business model of selling access directly to innovative service providers will enable Skyrove to recoup its costs much faster than the traditional model of marketing to end-users.

The added benefit for service providers is that they will pay much less than they would have if they had built their own infrastructure or tried to build services on the incumbents' networks, ultimately enabling cheap, easy-to-use voice and data services for the consumer.





The G-20 Summit: is it just another disappointment?

by IMD Professor of Finance Arturo Bris

The leaders of the G20 are meeting in Toronto (Canada) at the end of June. This is the fourth in a series of summits after the collapse of Lehman Brothers, organised with the original objective of building "a stronger, more globally consistent, supervisory and regulatory framework for the future financial sector, which will support sustainable global growth and serve the needs of business and citizens."

Given our experience in the previous three, there is not much to expect from our leaders, and by the end of June the world will continue moving at two different speeds: the fast pace of the United States regulatory reform versus the lack of co-ordination and inaction of European leaders.

One year ago in London, the G20 members defined the agenda for a worldwide regulatory reform. The pillars of the new era of financial regulation would be new regulations for systemically important financial institutions—including hedge funds; oversight and registration of credit rating agencies; the end of bank secrecy; tough new principles on pay and compensation; reduced reliance on complex and inappropriately risky derivatives; improved accounting standards; and impose regulation to prevent excessive leverage.

New rules — it was agreed — required co-ordination, as leaders realise that, unless all countries move in the same direction, economic agents would take advantage of differences in legal regimes, as the crisis had just shown.

Those initial, well-intentioned objectives have now been forgotten. For the Toronto summit, the focus will be on recovery from the global economic and financial crisis, and the implementation of commitments from previous G20 summits. Alas, the only commitment that came out of the last summit (Pittsburgh), was to "reach agreement on an international framework of reform," that is, to agree to co-ordinate on how to co-ordinate.

Where do we stand, as the new summit is about to begin?

Impressively, the US has now produced, in record time, the most radical regulatory reform since the Securities and Exchange Act of 1933.

Already in December 2009 (only seven months after the London summit), the House of Representatives passed by a partisan vote of 223 to 202 the Wall Street Reform and Consumer Protection Act of 2009, which has been amended and finally approved by the Senate a little while ago.

The "Wall Street Act" perfectly corrects the failures that led to the 2008 crisis. In particular, it imposes shareholders' approval of executive compensation; thoroughly regulates over-the-counter derivatives; imposes for the first time in history the participation of consumers in the control of financial institutions; makes registration of hedge funds mandatory; regulates rating agencies; and strengthens investor protection.

What about the European countries? What have Germany, France, Britain, Italy and the like achieved?

Well, in the old continent, ideas are not that clear.

France and Germany have made the regulation of hedge funds and private equity their primary objective, while Britain, naturally opposes it.

The European Parliament is looking at the Alternative Investment Fund Management Directive proposal, which basically wipes out hedge funds and private equity firms from Europe. There have also been some important agreements with 'tax havens' such as Luxembourg and Switzerland against bank secrecy. And that's about all.

Europe has missed the amazing opportunity that the crisis gave it to become the financial centre of the world, after the failure of what President Sarkozy called "Anglosaxon capitalism". By the time Europe cleans up the mess, the United States will have established their dominance in financial markets again.

Therefore, the US is coming to Toronto with its homework done.

Meanwhile, European leaders, who have been very busy with other matters, like elections and Greek quasi-defaults, come together again with the hope that someone else will do the work for them.

The Wall Street Act teaches us a simple lesson: the need to change financial regulation was obvious. AIG and Lehman Brothers collapsed because they heavily relied on derivatives that were not regulated and their trading was not centralised.

Accounting rules created the pervasive effect of allowing financial institutions to book the same asset three, four or one thousand times. Investors were not protected because markets lacked transparency. Understanding these problems would have just required a little bit of finance education for our leaders. But, not surprisingly, the last summit of the G20 in Pittsburgh ended up with a clear determination on ... Iran nuclear capabilities.

Even worse, the G20 has stated in all previous meetings that their ultimate objective is to lay the foundation for sustainable and balanced growth. Such a beautiful mission is enlightening, but also idealistic and just a declaration of intentions.

I bet the Toronto summit will end up with the same statement, so as to appease the electorate in the respective countries and to provide an excuse for the next meeting. I truly hope this one is the last and we truly start working on what matters.

Novozymes and Ceres partner on biofuel crops

American energy crop company Ceres, and Novozymes, the world's largest enzyme provider, have entered a research collaboration to co-develop customised plant varieties and enzyme cocktails for the production of cellulosic biofuel.

The companies expect to improve the process of converting biomass to fuel through more effective enzymes and higher quality energy crops in a joint optimisation project that will lead to greater fuel yields, as well as lower capital and operating costs.

According to Novozymes Cynthia Bryant, this is an example of how technology providers from different parts of the value chain can get together to make cellulosic biofuel a commercial reality. Energy crops have an important role to play in the world's future, sustainable energy mix.

The Billion Ton Study published by the US Department of Energy, shows that one third of the total sustainably collected biomass potential from agricultural resources can come from perennial crops, claims Bryant.

Energy crops such as switchgrass, miscanthus and sorghum are high-yielding crops planted specifically for their energy content. They thrive with less water and fertiliser than other crops, and will often also grow on marginal lands where other crops cannot flourish. Energy crops also appear to have huge environmental benefits and the US Environmental Protection Agency estimates that biofuel from switchgrass can reduce carbon dioxide emissions substantially.

Ceres and Novozymes will initially work to determine the best enzyme cocktails for the bio-refining of Ceres' commercial switchgrass seed products. The partners will also begin similar evaluations of sweet sorghum, and Ceres' researchers plan to develop customised plant varieties that can be degraded more easily by Novozymes' enzymes. Enzymes convert the biomass from energy crops into sugar which can then be used to produce biofuel and other bio-products.

Spencer Swayze, senior manager of business development at Ceres, says that by using advanced plant breeding and other genomics-based tools, Ceres scientists are developing energy crops that minimise the components in biomass shown to decrease conversion rates and yields. In fact, one of the advantages of dedicated energy crops is the ability to better control its composition.

He is confident that the time will come when the company can approach conversion facilities and their feedstock suppliers with a complete package of tailored seed varieties and enzymes as well as crop management and processing recommendations.

Ugandan Elizabeth Mukasa wins WCIT Award

A complete role model is how adjudicators described Elizabeth Mukasa when announcing that she had won the WCIT 2010 Give Challenge a Change award for developing an information technology platform that is qualitative, integrated and affordable.

At the same time she developed an innovative electronic learning program using the local language Luganda for her students. Tuition fees were kept to a minimum (or sometimes she just didn't charge for them) so that vulnerable women students could participate. Her program helps people set up their own business and she has trained more than 100 people to use digital and information technology to improve their businesses.

During WCIT 2010, delegates addressed global impact issues regarding economic and social development and exchange policies and ideas on how information technology can enable change and innovation in all parts of the world. For that reason WCIT wanted to highlight the shining example of what embodies change."

At the age of 45, Mrs. Mukasa studied for an Information Technology Diploma at Lewisham College in England and then in 2008 she spearheaded the development of an electronic program in Uganda. Today, over 250 participants - rural-urban, men and women with or without formal education had successfully accessed the IT literacy model. Small, medium and micro-enterprises contribute to 80 percent of Uganda's economic activity.

The World Congress on Information Technology (WCIT) is regarded as one of the world's most influential conferences on IT. WCIT is the flagship of the World Information Technology and Services Alliance (WITSA), a consortium of IT branch organisations from across the world whose members represent over 90 percent of the global IT market. The 17th conference was held in the RAI exhibition complex in Amsterdam in May this year and is supported by the European Commission and hosted by the Dutch IT branch organisation, the Dutch Ministry of Economic Affairs and Amsterdam City Council.

Mrs. Mukasa receives a cheque from CEO WCIT 2010 Mr. Ralph van Hessen.

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New solar inverters get 98,4 percent efficiency rating

The new Sinvert PVS device line for medium-sized and large photovoltaic power plants supplements the range of solar inverters offered by the Siemens industry automation division.

According to Siemens, the three-phase transformer-less inverters with graded power outputs of 500, 1000, 1 500, and 2 000 kilowatts achieve an efficiency level of 98,4 percent. The version with two megawatts is the most powerful transformer-less device currently on the market. The top efficiency of the new Siemens' inverters enables plant operators to realise a high yield when feeding into the medium-voltage grid, for instance in the case of ground-mounted PV systems and systems mounted on large roofs.

Siemens says the new compact Sinvert PVS central inverters are also available in photovoltaic containers, complete with medium-voltage components. These inverters will be presented for the first time at Intersolar Europe in Munich by Siemens.

The efficiency level, which is apparently 0,2 percent higher than that of comparable products, enables a considerably higher yield to be achieved throughout the operating period of a photovoltaic system.

With the master/slave technique it is possible not only to increase plant availability, but also to attain a longer plant service life. Furthermore, the efficiency level is higher than that of a stand-alone system, as the inverters can be switched in and out as required, depending on solar radiation.

The efficiency of the solar plant can thus be optimised, particularly in the case of partial-load operation: the plant starts up at low solar radiation, and reaches very high efficiency levels even in the lower performance range. As the inverter sub-unit with the fewest operating hours is always controlled as the master, this enables the operating time to be evenly distributed between the inverters, which will prolong the service life of the plant.

The new Sinvert PVS inverter series can be easily integrated into Scada systems through standardised communication interzfaces. A pixel-graphics display with touch screen enables user-friendly local operation of the inverters and visualisation of the performance data. The new devices comply with the medium-voltage guidelines of the German Association of Energy and Water Industries with all requirements including FRT (Fault Ride Through) and active power control.

'Pretty' energy efficient bulbs – show us how?

Resourceful designers can show off their creativity and technological know-how for a good cause – and the chance to win handsome cash rewards – as Eskom's Energy Efficient Lighting Design Competition for 2010 challenges both the novice and the seasoned professional to come up with ideas for energy-efficient luminaires.

The competition provides:

- Students and professional designers with a platform to design and build imaginative lamp prototypes that work, and are attractively designed. As the name of the competition implies, it is of major importance that all designs make use of energy-efficient light sources.
- Secondly, professional designers are also invited to submit innovative energy-efficient designs, systems or products that are suitable for residential applications. These may include, for example, a complete lighting system for a low-cost housing. Once again, the key word is energy-efficiency and wherever possible, the use of alternative power sources.

Eskom's drive to promote energy efficiency stems from the fact that South Africa needs to save energy. Since compact fluorescent lamps (CFLs) hit the market, it has become more and more apparent that existing lamp designs are not suitable for use with these bulbs.

Eskom launched the EELDC to encourage new designs that will demonstrate efficient lighting technologies (for example discharge, fluorescent and LED technologies) that can be used in contemporary and attractive luminaires in residential applications.

The prizes are as follows:

Category A: residential luminaire design (students – individual):
First prize: R30 000;
Second prize: R20 000
Third prize: R10 000
Educational institution (of the winner) prize: R10 000
The ten most promising previously disadvantaged designers: R1 000 each
Category B: innovative energy-efficient lighting design (professional):
Innovative energy-efficient design, system or product: R30 000
The winner in the professional category will receive a Sparks floating trophy.
Top regional finalists (20): R5 000 each

The closing date for entries is 30 July 2010 and entrants may participate in one of two categories, namely a student category for individual entries, or a professional category.

Full details are available on the following website: www.lighting-design.co.za or from the competition organisers at (012) 997-1334 or via e-mail at amroux@mweb.co.za.

iPad a tool that's a 'nice to have' that becomes a 'must have'

By WATTnow's Technology Correspondent

If you're reading this then hopefully you are not thinking: "Oh no, not another iPad review." Having used my iPad for over a month now, I feel qualified to comment, unlike some reviewers, who seem to have had a lot to say shortly after taking it out of the box.

I'm going to avoid the obvious cliché of: "I'm typing this review on my iPad." It's not that I couldn't type it on the device – remarkably, the touch screen keyboard is actually perfectly functional if you can touch type – it's simply that it's not really that kind of device. In fact, as I type this on my laptop, I have the mind map I prepared for this article open on the iPad next to me.

Carrying around a data pad is something I've been doing for over ten years. It's ironic that Apple's Newton never really took off, because its successor, Palm, certainly did. I stopped using paper notebooks when the Palm III came out, and have kept all my notes, shopping lists, maps, and even some music and videos on a Palm device ever since.

As smart phones appeared, some of the functionality I had on the Palm (like mail, calendar and contacts) started to move to the phone, but it's never been entirely displaced. Over the years, people have often asked me why I would carry around a Palm as well as a phone. It's obvious, really – you can't make notes on the same device you're holding against your ear.

Given my experience of the data pad lifestyle, I had no misconceptions about what an iPad was supposed to be. It was clear from the initial announcement that Apple really meant when it said that this is a new class of device; it's not a laptop, it's not a phone, and it's certainly not a netbook – something Apple CEO Steve Jobs made clear at the iPad launch.

Apple never really benchmarks itself against the real world, so perhaps the best place to start, if you want to understand what the iPad is supposed to be, is Star Trek. Simply put, the iPad is the data pad of Star Trek, in much the same way as the cell phone is the communicator. Given that paradigm, the iPad is to store stuff that you need to carry around; to read, watch or listen to stuff like books, articles, audio and video; to show stuff to other people, like photos, presentations, or your car hire voucher; to share stuff over the network; and, to a lesser extent, to create stuff.

One of the most common descriptions you see of the iPad is that it's like a giant iPhone. Well, yes, but that's really missing the point – the size and the high-resolution screen really do make it something else entirely.

What is certainly true is that many iPhone and iPod applications (apps) have finally come into their own on the screen real estate and processing power of the iPad. It must be a dream platform for those developers who tried to cram as much information as they could onto a phone screen.

In fact, most of the iPad apps I'd really like to see are simply big versions of iPhone apps. Developers have certainly taken advantage of this, selling high definition versions of popular apps at up to ten times the price, with presumably little additional development.

The basic paradigm of the iPad is certainly the same as that of the iPhone and iPod, rather than that of a laptop – you sync it to iTunes on your Mac or PC, and it runs one foreground application at a time, launched from a home screen, not a desktop.

Apple has responded to the demand for multitasking in iOS 4, the latest, rebranded version of the operating system, but this will only be released for the iPad later this year. Since the operating system is a really a variant of Mac OS – a true Unix platform – there's obviously multitasking happening in the background, but not from the user's perspective.

So clearly the iPad is not a laptop computer and isn't intended to replace a laptop computer. If you want a laptop, get a MacBook. Despite the Internet, laptops remain largely standalone personal computers – processing information in increasingly complex ways, with more processing power than the early mainframes.

In contrast, the iPad is a media device – it's really good at connecting you to information, with perhaps the most intuitive and natural user interface ever. While it has more processing power than your average mobile phone, it's not going to compete with your laptop in this respect. But unlike a laptop, you switch the display on a off at the touch of a button, just like a mobile phone, and it's always on and ready.

What being a network- and media-centric device does mean, of course, is that the iPad becomes a somewhat lonely place when it's not connected to the 'net.

That's not to say that it doesn't do some amazing things, like games and videos, while it's offline – just that, the longer you stay offline, the more your apps will yearn for connectivity – to update your mail, your calendar, your contacts, your newspapers, your

magazines, your books, your podcasts, your Facebook page, or simply to surf the web.

Once it is connected, the iPad becomes a window to the world. Steve Jobs may be right when he says the iPad is the most natural way to surf the web, skimming through pages at the touch of your fingers – it's the first device that lets me surf comfortably in bed.

You will discover quite quickly that there are really two kinds of apps – the online ones, which don't do much without the Internet; and the offline ones, which are standalone. However, there seems to be an increasing number of apps that cache recent data, allowing you to use them even if you're only connected at times, such as when you enter a WiFi hotspot.

It's like carrying a piece of the web with you. This may also be the reason why I find that I do less shallow skimming of articles and other media on the iPad than on a laptop, overcoming one of the apparent health risks of being online.

This brings me to the other common characterisation of the iPad – as an e-book reader. And yes, it certainly is one of those too. In fact, in competition with Amazon, Apple decided to build a bookstore behind the iBooks app, so that you can browse and buy books just as you would buy music, video and apps.

Of course, unlike Amazon's Kindle, the iPad is a general-purpose device, so you can load your favourite e-book reader, such as Stanza, and avoid the iBooks store altogether. Finally, there's a Kindle app, so you can read all your Amazon books as well. Completely unlike the Kindle, though, the large colour display is ideal if you're into comics, rather than boring text.

Newspaper and magazine publishers (and their online equivalents) have been quick to realise that the iPad is their future. You can choose between live versions of major newspapers that look more like print editions than websites, and entire, downloadable editions of monthly magazines (at a price, of course). Taking advantage of the display, there are some stunning photo news apps as well.

Of course, it's also an iPod. You can sync your whole music collection onto it, and you can keep up with the latest audio podcasts; but the iPad really comes into its own as a video device.

You're probably going to run out of space (even 64 GB) if you try to put your whole movie collection on it, but, with 10 hours of battery life playing video, this has got to be the best device to take on a long plane trip. For the moment, at least, no air hostess is going to think it's a phone.

Certainly, there's little doubt that the iPad is built for video. Although its native resolution of 1024 x 768 pixels is not quite full HD, and the aspect ratio of 4:3 is reminiscent of standard definition television, it has all the right hardware to enable it to play video smoothly and continuously for many hours.

No doubt, video will also drive data consumption and revenues for telecoms operators. Already, mobile network operators are blaming the iPhone for the crippling increase in data usage, and things are going to get much worse with the iPad. It's little wonder that operators around the world are introducing capped services.

Personally, I prefer to use WiFi, both at home and at work, and avoid bill shock from South Africa's high 3G prices. Of course, even on WiFi, you'll be reminded that South African broadband isn't yet quite what it should be.

Of all the devices I've owned (computers included), this is the one that's most likely to get me downloading half a gig of video without thinking.

Anyone who followed the launch of the iPad will have heard about the great Apple vs Adobe Flash debate. Despite the dominance of Flash for playing video on websites, Apple quite deliberately chose not to support it at all on its portable devices, opting instead for HTML5, which has much the same functionality.

Technically, their logic is sound, since the latter is almost certainly more efficient and stable on such devices, but this does mean that there are websites with video that simply doesn't play on an iPad. That said, most video I've watched on the iPad has been embedded in apps, like the YouTube app, and not in a browser and streamed from websites.

Given how many devices Apple is selling, it will be interesting to see if and when there's a global shift from Flash to HTML5 as they predict.

At first glance, you could be forgiven for thinking that the iPad is one of those electronic photo frames. In one respect, you wouldn't be wrong.

Some time back, we gave up carrying around photo albums, and carried around a notebook computer instead to show our friends and relatives our photos. Lots of people try to show off tiny pictures on their phones, a somewhat futile and unsatisfying exercise. Finally, with the iPad, there is a device that lets you store all the photos you've ever taken, with a screen big enough for your grandmother to see, and which you can carry around easily. As if to make the point, the iPad even has a standard scrolling photo frame screensaver mode.

From early indications, the iPad is going to fill a very interesting niche in gaming, somewhere between handheld gaming devices and larger consoles. The accelerometer and touch screen provide a whole new paradigm for action games, which are typically slick and compelling.

It's also the obvious platform for the computer equivalent of board games and similar less frenetic pursuits. I find myself playing card games that I wouldn't play with real cards, or bother to play on my computer either.

Much of the above sounds like play. What about work?

I've already mentioned the iPad's mail, calendar and contacts apps, which lie somewhere between the iPhone and Mac equivalents. These are solid and functional, and work seamlessly with Microsoft Exchange, but with a blend of detail and simplicity only possible on a large multi-touch screen.

Taking notes on an iPad is also one of its more obvious work uses, particularly where a computer would be inappropriate. While it is not quite as unobtrusive as my Palm, I've comfortably typed notes on it in many meetings. If you close the cover (which you'll need to purchase separately), it really does look like a notepad, both in the boardroom, and as you walk past the security guards who normally check laptops.

I wouldn't choose an iPad to create and edit complex documents, spreadsheets or presentations, but Apple has certainly provided fully functional versions of its Pages word processor, Numbers spreadsheet, and Keynote presentation applications (the iWork suite).

Mostly, I find myself using these to import and view Microsoft files, which they do a pretty good job on (I've had more trouble with compatibility between versions of Microsoft's applications).

Keynote, together with the iPad VGA cable, is just about the best way to produce a presentation apparently from nowhere. A PC would probably still be rebooting to try to recognise the projector by the time you've finished your presentation.

With the right apps, you can also do really neat stuff, like turning your projection screen into a blackboard and use your finger as the chalk on the iPad. The iPad does also produce standard definition analogue video (using a different cable), but this is more likely to be useful to show video at home.

There are several apps that allow you to copy files to/from your iPad over WiFi, which you can then view or open in other apps. It's not quite like having access to the whole file system, but the iPad does look like just another drive to your computer. Other apps allow you to print to the iPad, something that has helped me save the planet from those annoying one-page printouts when you need to take a map or an e-ticket with you.

There are some truly impressive iPad apps that don't fit neatly into any category. Many of these are best described as multimedia databases – what books would have been if the iPad had been around before paper. These typically have lots of offline information (pictures, videos, maps), but may also access additional online information and updates.

So who is going to use an iPad?

I would stop short of suggesting, as some reviewers have, that it's going to be the device for everyone else – those who wouldn't normally use computers. It's also obvious (particularly from the sales to date) that it's not just a device for a few Apple fanboys, though I have to side with the fanboys on the sheer beauty and design of the device.

Engineering design is something that Apple has always been superb at, ever since their proverbial (and, in their case, literal) garage. More than any of their competitors, they seem to understand that proper design (mechanical, electronic, software, human-machine interface) is the bedrock of proper functionality.

I think there will be a lot of people who buy an iPad for its media capabilities, both offline and online, and there will probably be quite a few business users, and those who use it as a data display and capture device in specific industries, with custom apps. Some will buy it for gaming, and some for reading e-books, and some just to surf the web.

A lot will find, as I have, that it's a useful thing to carry around, at home or at work.

One cannot really discuss Apple devices without talking about price and global availability.

Their devices are relatively expensive compared to their wannabe clones and copies in most countries. Certainly, over the past

few years, the company has noticed that the world is bigger than California, and has become better at distributing to many countries.

However, some parts of the value chain, most notably those with copyright restrictions, like the music and videos of the iTunes store (and parts of the App Store, like some games, and no doubt some parts of the iBooks store) simply fail to reach the whole world.

Fortunately, you'll find quite a number of iPad apps on the SA iTunes store already; if you want more, there are some loopholes that enable you to get access to other countries' iTunes stores, and you may want to do this to get the most out of your iPad.

iPhone apps are a lot like widgets (for those with Macs) – the best ones are simple one-trick-ponies that do something specific, and do it very well. That has also meant that, statistically, many apps (even paid-for apps) are downloaded and used once, then never again. Only the really useful ones have longer lives.

In my experience, there are fewer of these once-off apps for the iPad, or perhaps it's just that iPad apps are weightier, and more expensive, and hence one is more selective in downloading them.

Perhaps the most startling and refreshing aspect of the iPad is its user interface. It makes use of the same capacitive touch screen technology as the iPhone, with the same patented multi-touch capability, as well as an accelerometer, and a GPS (on the 3G version). On a screen that size, the result is truly amazing.

Scrolling and panning, zooming and rotating are simple and intuitive. The processor and graphics are much faster than a typical smart phone, making the iPad feel more responsive and generally quicker. Some applications feel as if they've finally been set free – maps are just right, and Google Earth has to be felt to be believed.

All this hyperbole is going to be lost on tomorrow's digital natives. I've already discovered that there's hours of amusement in an iPad for a four-year-old, who is quite capable of driving the touch screen in various apps without any instruction. Presumably, this is exactly what Apple intended.

Quite apart from looking at pictures, videos and comics, sketching and generally moving things around, I'm sure there's going to be a market for apps for this age group. Of course, at the price, you're probably not going to let the iPad out of your sight. Even your cat's going to get jealous of the attention you pay it.

Of all my devices, the one that seems most likely to be supplanted by the iPad is the Palm, rather than the mobile phone, the GPS, or the laptop. On second thoughts, it's replacing a little bit of lots of different devices, including the phone and laptop, but also the game console, Amazon Kindle, TV, DVD player, and even the photo frame.

Which iPad should you choose – 3G or WiFi, 16, 32 or 64 GB? 3G is certainly an added bonus, but by no means as essential for a phone, given that you are mostly likely to use your iPad at home or the office, or perhaps in a coffee shop or an airport. You can always create your own WiFi hotspot with another portable 3G device, even if you cannot tether an iPad to a phone with Bluetooth.

Although the WiFi version doesn't have a GPS, some apps seem uncanningly capable of finding your position from knowledge of public hotspots. I'd recommend the largest memory size you can afford, since some of the best iPad apps have large offline databases, and you're going to want to put your photos and videos on the device in addition to books, music and other files.

Why would you buy an iPad, apart from it being yet another must-have device that gets you attention?

There's little doubt that it's a new and interesting platform, but, as with all computing platforms, its usefulness is ultimately going to depend on applications and their associated content.

In the iPad's case, it lies at the heart of one of the world's largest online ecosystems. I certainly keep discovering new uses, and no doubt you will too. The real question will be whether you need one, or just want one, especially if you count the cost of content and connectivity.

"Only connect!" wrote E.M Forster. Until now, making the connection between the passion of the human world and the bits of the digital world has been complicated, and at times just plain difficult. The iPad certainly makes connecting a lot easier and more intuitive, and opens a new window between you and your digital media.

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Concorde to fly again?

The magnificent Concorde may take to the skies again as aviation enthusiasts get to work on a £15-million project that may see a few of these majestic planes being used at air shows and other events around the world. The engines of a French Concorde are being examined to see if the jet can be made resurrected.

Concorde was retired from active service seven years ago but a group of enthusiasts are determined to keep it flying and a partnership between the British Save Concorde Group and the French Olympus 593 group has started working on assessments of the Concorde at the Le Bourget Air and Space Museum in France.

The tests will first establish whether the existing engines can safely be restarted and whether the jet would be capable of taxiing along the ground. Once this has been established the jet will be put through a series of tests to see if it can earn an airworthiness certificate.

According to Ben Lord, vice chairman of Save Concorde Group, says that the project will involve British and French engineers who worked on the Concorde in France and Britain while the plane was still flying at supersonic speeds between Europe and the United States.

It is hoped that at least one Concorde will be able to fly during the opening ceremony of the London Olympics in 2012.

Meanwhile, the trial over the Concorde crash that killed 113 people in Paris in 2000 has drawn to a close and a French court is due to deliver its verdict on the inquiry in December this year, more than ten years after the accident.

Sumbandila is now providing quality images from space

The Sumbandila satellite is now fully operational and is being controlled by the Satellite Applications Centre at the Council for Scientific and Industrial Research on behalf of the Department of Science and Technology. Russians from the Baikonur Cosmodrome in Kazakhstan launched the South African made satellite in September last year.

The R26-million satellite has had a series of problems since its launch mostly caused by the severe radiation in its low-Earth orbit about 500 kilometres in space.

The key problem is, according to Raoul Hodges, manager of the Satellite Applications Centre, power distribution system failures that led to mission control losing access to the control board of one of the two charge-coupled devices, (CCD) disrupting the focal plane of SumbandilaSat's main sensor, a 6,25 metre square six-band multispectral imager.

Each CCD covers three bands and the one that has been lost operates the green, xanthophyll and blue spectral bands. The remaining CCDs cover the more important red, red-edge and near-infrared spectral bands.

Hodges says that despite the setback, the quality of imagery data being received by mission control is very good and the data is being processed each day and then being archived for people who might need to use it. Since the power disruption to the one CCD there have apparently been no further operational problems.

The satellite was built by Sun Space & Information Systems, a Stellenbosch-based company.

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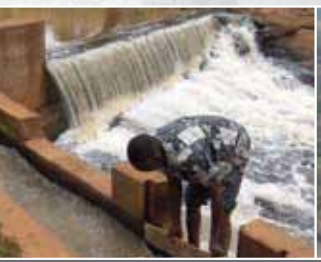

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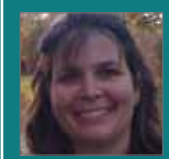

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Pre-orders for iPhone 4 top 600 000 units in US

Apple's newest offering, the iPhone 4 has notched up 600 000 pre-orders in the first day, breaking Apple's own records for the phone and even for the iPad. The phone, originally expected to ship before the end of June is now only going to be available from the middle of July.

The iPhone 4's one-day pre-order total was ten times higher than the iPhone 3GS's pre-orders last year. That model went on to sell a million units in the first three days.

In the United States, the iPhone 4 costs just $199 while the iPhone 3GS's price has dropped sharply to just $99 (R742,00). The entry-level iPhone 3GS costs R8 445 in South Africa, giving consumers a clear idea of how much of a premium they are paying for Apple's products in this country.

I new iPhone has a host of new features including FaceTime, an application that allows you to turn video calls into a reality because the phone has two cameras, one on the front above the display and one on the back.

The front camera has been tuned for FaceTime so it has the right field of view and focal length to focus on the face at arm's length. The second camera is used as it should be, to capture digital photographs.

But it too has its uses for video calls because you can instantly switch to the back lens by tapping the screen and showing the caller what you can see. Then you tap the screen again and it switches back to your face.

Through the use of what Apple calls retina display, the images displayed on the iPhone uses a pixel density that is too high for the eye to distinguish individual pixels, making everything, from text to images crystal clear.

It comes with a host of usual features allowing the phone to be used for music, videos, Internet browsing, e-mail, maps, voice control and many other too. Through Apple's iPhone Apps Store, hundreds of additional applications can be downloaded and used. Some are freeware while others carry a relatively modest charge.

Layar upon layer of Layar

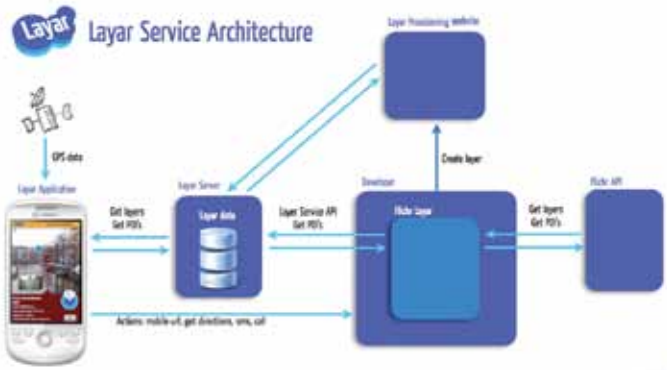
Dutch company, Layar has apparently signed deals with various mobile phone manufacturers allowing them to use – and build on – the augmented reality software developed by the company. Layar's products are typically used in sports television broadcasts where digitised images enhance television pictures.

According to the company, 2,2-million people used its software in the past year and about 700 000 received augmented reality images in the past month alone. Video game manufacturers, Sony and Microsoft use Layar'software to create more interactive computer games.

The software has become increasingly popular since it was made available to mobile phone users so that someone can now hold up a mobile phone's camera, point it at a city street and – if it has a global positioning satellite sensor, a compass and the right software – can overlay other images and information over the street scene.

Layer is one of the leading providers of software that makes augmented reality usable on iPhones and Google's Android platform. Layar says that expects to recruit tens of millions of users in the coming year and already LG, the world's third largest phone manufacturer has signed a worldwide distribution agreement with the company.

Matt Miesnieks, customer development exectuve at Layar says that more global distribution agreements are due to be signed by the world's leading manufacturers and, he says, Layar will be distributed in 75 percent of all mobile phones by 2011.



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Goodbye bi-focals – here come electronic glasses

Traditional bi-focal or multi-focal spectacles could soon be a thing of the past with the invention of electronic glasses that automatically adjust to let the wearer view objects at different distances. The spectacles are due to be launched in the United States later this year and in Britain next year.

They use lenses that change their strength when a small electric current passes through them. A layer of liquid crystal, sandwiched inside each lens, alters its refractive properties according to the amount of current applied, thus adapting the focal length according to what the wearer happens to be looking at.

Traditional bi-focals use two lenses of different strengths in front of each eye to compensate for deteriorating vision and were believed to have been invented by Benjamin Franklin in the 1780s.

Many users complain of headaches and dizziness when wearing them and get frustrated by having to make small adjustments to the angle of their heads while reading.

The electronic glasses have been developed by PixelOptics – a United States-based firm – and can be adjusted manually to view objects at different distances by pressing a button on the side of the frame.

The electronic lenses have a number of in-between settings rather than the traditional near or far option common in bi-focals. The focal length also changes when motion sensors detect that the wearer is looking down – for instance when reading.

Trials are already underway in the United States and according to Peter Zieman, a director of the company, PixelOptics has been working on the electronic glasses for more than 10 years.

He says that spectacles have hardly changed since they were invented and the most recent change, that of transition lenses, occurred more than 15 years ago anyway. He says that PixelOptics' glasses bring modern technology to an old solution that improves deteriorating eyesight.

New constellation of mobile satellites

International mobile satellite services provider, Iridium has ordered 81 spacecraft so that it can upgrade its global network and has commissioned Thales Alenia Space of France to build 66 of these satellites that will create and operational constellation. The remainder of the satellites will be used for spares.

This is the biggest commercial space project in the world today. The order is valued at $2,9-billion and it has apparently been underwritten by the French export guarantee organisation Coface.

Iridium – which allows caller to make a phone call anywhere in the world – began operating in 1998 but ran into financial difficulties within a short space of time until it was purchased out of Chapter 11 bankruptcy by investors.

Today, the company has about 360 000 subscribers around the world and generates revenues worth hundreds of millions of dollars each year. The Iridium constellation operates in a low-Earth orbit about 780 kilometres above the planet and the spacecraft are aligned in six planes that relay communications between themselves and ground stations to provide global coverage.

The arrangement of the satellites and their antennas give rise to Iridium flares as sunlight glints of the edge of the spacecraft at different times of the day. The new constellation is expected to work for at least the next 20 years.

Iridium is not the only satellite phone operator in the world and its competitor, Globalstar is also planning to renew its network having commission 48 spacecraft from TAS that will probably launch later this year.

Globalstar operates at a slightly orbit than the Iridium constellation.

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More than one God particle?

Physicists working on CERN's Large Hadron Collider project have announced that there may be five so-called God particles – or Higgs boson – instead of just one. The data emanating from experiments at the LHC may point to new laws of physics beyond the current accepted theory known as the Standard Model.

The Higgs boson nickname comes from its importance in the Standard Model as it is the sub-atomic particle which sets out to explain why all other particles have mass.

The notion of multiple Higgs bosons appears to be supported by results gathered by the DZero experiment at the Tevatron particle accelerator at Fermilab in Illinois.

DZero is designed to determine why the world around us is composed of normal matter rather than the ill-defined opposite of anti-matter. Researchers working on DZero observed collisions of protons and anti-protons in the Tevatron. The collisions produced pairs of matter particles slightly more often than they yielded anti-matter particles.

Physicists had seen such differences before and had dubbed them the CP violation but these effects were small when compared with those in the DZero experiment where there was much more significant asymmetry of matter and anti-matter.

According to researchers Bogdan Dobrescu, Adam Martin and Patrick J Fox from Fermilab, this large asymmetry effect can be accounted for by the existence of multiple Higgs bosons. Their data points to five Higgs bosons with similar masses but different electrical charges.

Three of the Higgs bosons would have a neutral charge while one each would have a positive or negative charge. Martin says that in models with an extra Higgs doublet, it is easy to have large new physics effects like this DZero result while still keeping much of the Standard Model intact.

The Standard Model was developed in the 1970s and incorporated all that was then known about the interactions of the sub-atomic particles. However, the Standard Model is far from complete as it cannot explain gravity or dark matter that makes up about 25 percent of the universe.

The two-Higgs doublet model ties in with a theory in particle physics known as super-symmetry, which represents an extension of the Standard Model in which each particle has a more massive 'shadow' partner particle.

Evidence of super-symmetry and the Higgs could be uncovered during experiments at the LHC.

A 'war-chest' worth billions of dollars in Afghanistan?

War-torn Afghanistan may be sitting on untapped mineral deposits worth more than a trillion dollars according to the country's Ministry of Mines. A study conducted by a team from the United States Pentagon, the US Geological Service and USAID has calculated that mineral deposits worth $900-million are waiting to be tapped.

The geological surveys of the country have discovered large deposits of iron ore, copper and lithium. Results of the survey were actually released in 2007 but in December last year, the worth of these deposits was finalised.

Jawad Omar, spokesman for the Ministry of Mines says that the exact value of the mineral wealth has yet to be confirmed but he says that there is no doubt these deposits will have a significant impact on the future development of the country.

Apparently an internal Pentagon memorandum – published by the New York Times in June – claims that Afghanistan could become the "Saudi Arabia of lithium". Lithium is an increasingly vital resource for use in batteries that power a growing array of products ranging from mobile phones to electric cars.

Currently, Bolivia boasts the largest known resources of lithium.

However, the US researchers have cautioned that while these mineral reserves in Afghanistan may be huge, it would still take many years to build a large-scale mining industry and, without peace in the region, investors would probably be reluctant to invest in the country at all.

Afghanistan currently has a gross domestic product of about $12-billion so the mineral wealth could represent a huge growth opportunity for a country that has been ravaged by war and where poverty remains a huge challenge for the government and the people.

The estimated value of mineral deposits in Afghanistan is:

- Iron - $412-billion;
- Copper – 274-billion;
- Niobium – 81-billion;
- Cobalt - $51-billion;
- Gold – 25-billion.

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Are you suffering from change blindness?

How many people – and more specifically how many men – have failed to notice a friend's new hairstyle of missed a road sign that indicates a change of speed? Well, this failure to notice has now been given a name: change blindness and is apparently caused by the enormous amount of filtering of visual information done by the brain each day.

Now scientists at Queen Mary University of London have invented a spot-the-difference computer game that is aimed at helping them study how observant people are.

Scientist Milan Verma says that change blindness is the failure to notice seemingly obvious changes and he is now calling for volunteers to play the game that consist of different images of the same scene that flash onto the screen.

The image alternates between the pre-change and the post-change versions and volunteers have to press a button when they spot the change.

Apparently scientists and developers of artificial intelligence have been interested in the ability of people to quickly spot a change in a scene.

The scientists who are studying change blindness are hoping to incorporate their biological findings into the design of robots based on human vision and perception and then artificially recreate it.

According to Verma, all previous studies of change blindness were based on manual manipulation of the pictures but the computer game has changed this by creating an algorithm allowing the computer to make the changes.

It is also using artificial intelligence technology to generate experimental stimuli to test human perception. Apparently the computer uses information about human attention and perception to generate two pictures that people will view in the identical way. But one picture has subtle differences from the other.

This allows scientists to get an accurate measure of how noticeable the change is. So far the research seems to indicate that contrast plays a role in spotting differences, so colour, orientation or contrast luminance are more likely to pop out and be noticed.

The research also seems to indicate that people will spot whether something has been removed from a scene more quickly than if it has changed its colour. The research has already drawn some interest from advertising agencies that want to use it as another device to grab attention.

Guggenheim Foundation's joint project with YouTube

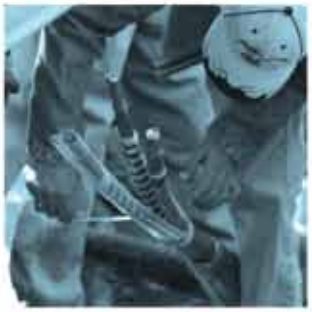
The prestigious Guggenheim Museum and the Guggenheim Foundation have joined up with YouTube and launched a competition to select 20 videos from the Internet and then showcase these at the Guggenheim in New York in October. The competition is open to anyone and can include any movies or videos made over the previous two years.

The Guggenheim project – known as YouTube Play: A Biennial of Creative Video – is open to creative professionals and amateur video makers and the deadline for entries is 31 July this year. The videos must run for up to 10 minutes and must be accompanied by a written statement.

A shortlist of 200 finalists will be chosen and these will be flighted on YouTube before the final 20 winning entries are selected. A panel of judges from the international creative community will adjudicate the entries and decide on the final winners.

According to Richard Armstrong of the Guggenheim Foundation, creative online video has become one of the most compelling and innovative opportunities for personal expression in the world today.

He says that the submission of video material is now a reality for anyone who has a mobile phone or video camera and access to the Internet. Billions of viewing minutes are uploaded and downloaded from YouTube every day as more and more people publish different video clips from all over the world.



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Internet DNS to finally be secure

Existing Internet addresses are to be made considerably more secure in order to minimise scam activity that creates false Internet pages that claim to be something that they are not. The new Domain Name System Security Extensions (DNSSEC) will be available from July.

The new extension is expected to close the loophole that allows hackers to intercept domain names and redirect users to fake websites. The domain names system (DNS) was created in 1984 and effectively had no security included with it.

The DNS allows computers to read web addresses and direct the user to the correct website. According to Leslie Daigle, chief Internet technology officer at the Internet Society – the home of the standards body that developed the new extension – says the new system uses cryptographic and digital signatures to verify each query and ensure the response has not been compromised.

Increasingly cyber-criminals are using false DNS servers to intercept legitimate web address and redirect users to fake sites in order to steal personal information such as bank account details or credit card numbers.

The Internet Corporation for Assigned Names and Numbers has overseen the development of the new security extension. It is the administrative body behind all registered Internet addresses.

Dan Kaminsky, chief scientist at security firm Recursion – and the man who exposed vulnerabilities in the DNS - says that he has seen the new code and its is awesome as it will make the Internet that much safer and more secure.

Banks in South Africa have all faced different types of attacks from hackers including the creation of false websites that are supposedly the real thing but, in truth are actually 'phishing' for personal information.

Cyber-crime around the world has become and increasingly severe problem with billions of dollars being stolen from bank accounts, in fraudulent transactions and through ingenious methods aimed at stealing someone's identity and using that information to create a new identity.

While Internet specialists are keen to halt the growing levels of crime, cyber-criminals are just as determined to keep fleecing new victims.

A Tweet signals Ronnie Gardner's final moments

This world of ours is certainly getting to be a bit bizarre. In June the Utah State Attorney Mark Shurtleff sent out a message on Twitter, via his iPhone stating: "I just gave the go ahead to Corrections' Director to proceed with Gardner's execution. May God grant him the mercy he denied his victims".

And that is how the execution, by firing squad of convicted murderer Ronnie Lee Gardner was announced to the world. Then a streamed press conference was held immediately after his death.

Apparently in the United States, Shurtleff was doing nothing unusual because news organisations and politicians are using social networking sites to spread news.

There are about 7 000 people who have subscribed to Shurtleff's tweets but the way that the Internet and Twitter are used, his announcement quickly spread around the world and, within minutes, the BBC announced Gardner's execution on its news services.

The public reaction to the tweet was also virtually instantaneous as the original message was forwarded to more and more people and, just as quickly, the public outcry against his execution started to build.

Five volunteer riflemen executed Gardner after a bag had been placed over his head. It is the first execution carried out in the United States since John Albert Taylor in 1996. Gardner chose death by firing squad on the basis that, in his words, he had murdered by the gun and would die by the gun.

The volunteers were not told if they received a blank or live round to ensure that the person who actually fired the lethal shot was unaware of it. All death-row inmates were executed by lethal injection until 2004 when the law was changed and they were allowed to choose to die by firing squad.

The Argument for a South African EV manufacturer

Kobus Meiring, the CEO of Cape Town-based Optimal Energy, which has developed the Joule electric car, suggests some compelling reasons for the electric vehicle industry and market to take off within the next few years.

"For a new industry to succeed it must meet a number of key criteria," he said in a recent presentation on the topic. "There must be strong reasons to change the status quo, there must be legislation or incentives to accompany this, the alternative must be cheaper and it must be an attractive alternative." Meiring believes the electric car industry will meet all these criteria, and his own company, which has spent the past three years developing the Joule electric vehicle in South Africa, hopes to gain a share of this market.

The manufacture of motor vehicles is one of the world's largest industries and it is going to have to change dramatically. It is simply a matter of sustainability. At the moment there are some 800 million to one billion vehicles worldwide, and this number will double by 2030.

This takes into account that while car density versus population in Europe is some 600 to 700 per 1,000 people, in a country like South Africa it is only 160 per 1,000 and in China it is about 10 per 1,000. Considering estimated global population growth figures over the next two decades, all it will take to achieve the 2030 projection is for regions like China to raise their levels of motor vehicle penetration to that of South Africa's.

At the same time, more than 50% of the world's population lives in cities and 75% of transport in cities is by car. Even though some cities have good public transportation infrastructure, the car is going to be with us for the foreseeable future. Anything that replaces existing motor vehicle technology will have to be proven technology and will have to be cost-competitive. Meiring argues that electric vehicles can meet these criteria.

Change to the Status Quo

For more than one reason, the continuation of the motor vehicle industry as it currently exists appears unsustainable. Some 99,9 percent of today's motor vehicles depend on fossil fuels, and transport is estimated to be responsible for an estimated 33 percent of the world's carbon dioxide emissions. Both carbon dioxise emission concerns and concerns relating to peak oil, create pressure to find alternatives to fossil fuel vehicles.

The climate change argument is that a 2° degree increase in average temperatures across the world above 1990 levels by 2080 will affect 3,5 billion people, with water shortages, food shortages and the spread of malaria to new areas. It is assumed that if we can keep carbon dioxide presence in the atmosphere down to less than 400 ppm, there is a 50 percent chance this increase will not happen. At the moment the atmospheric CO_2 content is 380 ppm. Thus, if you take these arguments seriously, an alternate motor vehicle technology is not a luxury. The second change to the status quo is that the volume of oil discovered has been decreasing every five years, and energy balances are not what they were. The first oil well in the US simply required a bit of drilling, and the energy balance in those days was 35 units out for one unit put in. For the Canadian tar sands this goes down to 2:1. While new discoveries will be made and recovery technology is evolving, the world is currently using five times more oil each year than is discovered a year.

Legislation and Incentives

The political will exists in many parts of the world to facilitate an electric vehicle industry. US president Barack Obama has said he would like to see one million plug-in electric vehicles on America's roads by 2015. Spain has said it would like one million electric vehicles on its roads by 2014. There have been taxation incentives in various countries, with 180 percent tax on new fossil fuel vehicles in Denmark with none to be paid for electric vehicles. In Israel the tax comparison is 70 percent tax on conventional cars versus 10 percent on electric vehicles. Even South Africa is introducing a tax related to carbon emissions of new vehicles.

Cost Savings

The electric vehicle market, when it reaches a degree of maturity, does provide the opportunity for cost savings. It comes down to energy efficiency. Aside from the energy efficiency equations related to different types of fuel production, there is the energy efficiency of the vehicle itself. Typically in today's cars,

only some 15 percent of the fuel burned by their engines is used to turn the wheels.

Apart from thermodynamic losses, there is the fact that the universal increase in traffic brought about by more cars on the roads decreases energy efficiency of motor vehicles. Engine friction accounts for some 5 percent of the energy, the power train accounts for some 7 percent to 10 percent, the cooling of oil, air and water accounts for some 30 percent to 35 percent, and another 30 percent to 35 percent is lost through exhaust gases.

In comparison, some 75 percent of the energy used by an electric vehicle is used to turn the wheels and the energy cost per kilometre is some 5 percent to 10 percent that of petrol/diesel fuelled vehicles. Of course one must take into account that a large portion of the petrol/diesel price is a tax, which is supposed to be invested in road infrastructure maintenance. However, all things being equal, mass market electric vehicles should be cost competitive with fossil fuel vehicles, particularly if one takes into account lifetime costs.

One of the big reasons for the entrenchment of fossil fuel vehicles and the slow pace at which the established OEMs have adopted electric vehicle technologies – and most are opting for hybrids and not 100 percent electric vehicles – is what Meiring describes as legacy issues. Today's motor vehicles are great pieces of engineering, which offer good value for money considering what one gets, but about 50 percent of the industry's profits come from the aftermarket; parts and maintenance.

Electric vehicles eliminate much of the requirement for parts, and are largely maintenance free. What OEMs don't like is that when a well-designed electric vehicle drives out of the showroom door, the company can expect not to see it again.

Attractiveness

Meiring says the nascent electric vehicle industry did itself no favours by creating the impression that electric vehicles are something like souped-up golf carts. It created the impression that electric vehicles are not real cars. "Purchasers of motor vehicles are conservative in their choices, and they will not tolerate too much variation from what they are used to," Meiring says. In addition the purchaser needs to be confident the support infrastructure is in place.

An example of the conservative nature of the motor vehicle market is the Smart. That vehicle was arguably the biggest revolution in the motor car industry in a decade, and sales have not yet achieved 200 000 a year. Part of the reason is that it looks too different.

"One of the biggest lessons I learned in this industry is that motor cars are as much fashion items as they are engineered technology," Meiring says. Optimal Energy has designed its vehicle accordingly and brought in Keith Helfet, who designed the Jaguar 220 in the early 80s, to design the Joule, which has the recognisable chic aerodynamic design of existing fossil fuel cars.

Electric Cars in South Africa

A number of technology evolutions have made it possible for electric cars to become a mass market reality.

Battery technology has evolved with the development of lithium batteries, which have seen the weight of the battery pack reduced from some 1,3 tons to 250 kg.

Lead acid batteries produce some 40 Wh/kg, while a lithium battery produces over 700 Wh/kg. Electric vehicles are operating their batteries at 150 Wh/kg, well below the limits of the technology because of the very strict safety requirements, taking into account the problems that have occurred with the combustion of overheating lithium batteries. However, this shows how much room for further improvement exists as electric cars and their battery technology evolve further.

The evolution of small permanent magnetic motors and the miniaturisation of power electronics have been key. Optimal Energy's Joule draws 250 Amps at 400 V and in the not too distant past this would have required much larger switchgear.

But the Joule is not only about research and development, with South Africa having, on various occasions, proven itself to be a good place for low cost R&D, examples being the Zebra battery, and, up to 1994, lithium batteries. Optimal Energy is venturing into the next step in the technology development chain, an area where South Africa has a weaker track record. It is looking to commercialise the Joule and establish itself as a mass market electric vehicle manufacturer in South Africa.

Meiring has obviously given the issue a lot of thought, and is not ignorant of the pitfalls, but still believes it is possible to manufacture electric cars for the mass market out of South Africa.

"In South Africa we have seven OEMs operating, as well as the presence of first, second and third-tier car manufacturers. But it is a small market, and to achieve the necessary economics of scale one must produce

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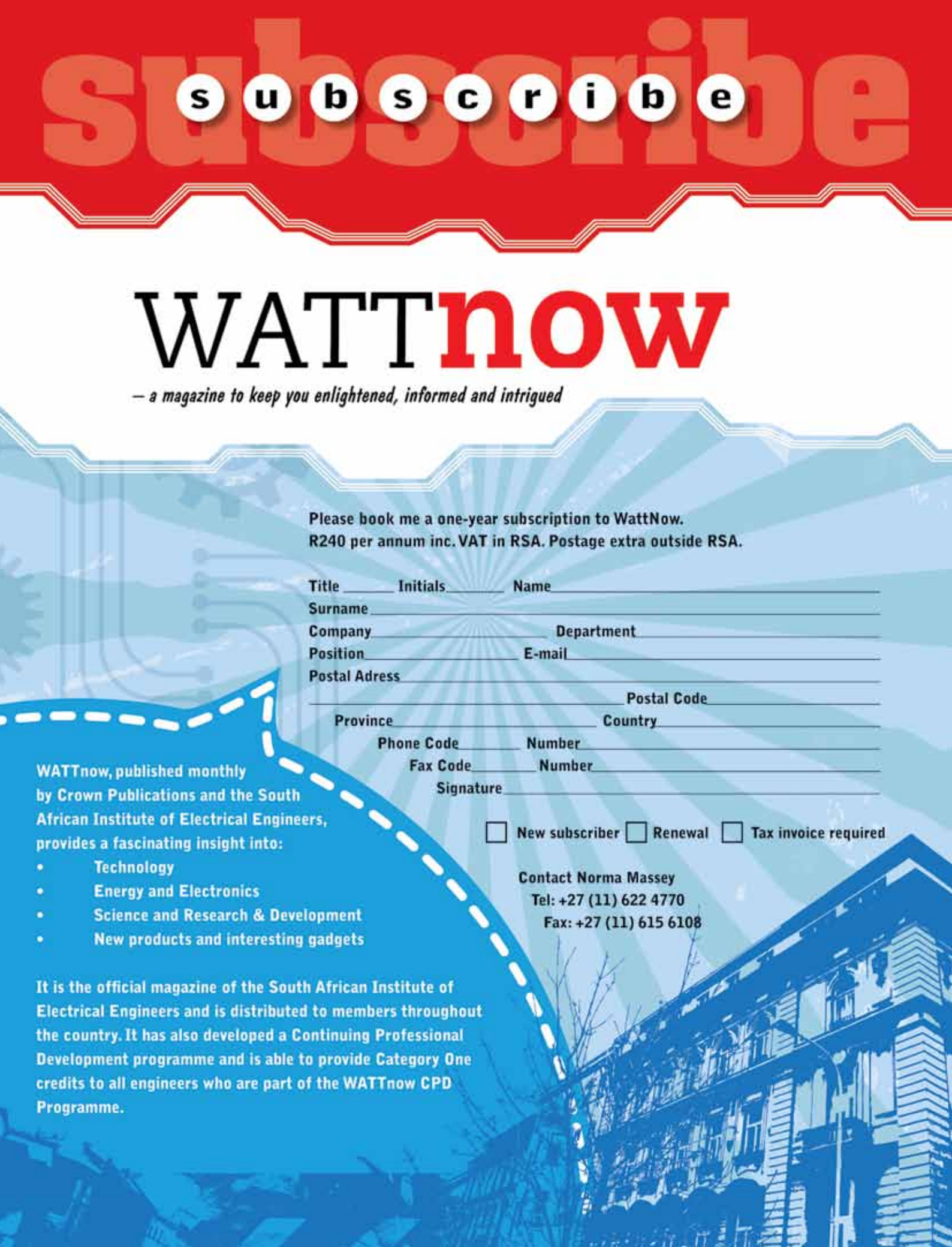

at least about 50 000 units a year," Meiring says. "However, no one in South Africa's motor vehicle market is selling 50 000 units of anything a year. Thus we will need to export."

If mass market electric vehicles are to be manufactured in South Africa, a whole industry will have to evolve around it. Component suppliers ranging from those who make air-conditioner units to vacuum brake suppliers to power steering suppliers will have to be in place. Where possible, Optimal Energy has used off-the-shelf technologies while focusing on areas where it can use its expertise to make a difference, an example being battery management.

The key item in any electric vehicle will be its battery pack, and while the battery cells can be obtained off-the-shelf, the electric vehicle manufacturers will differentiate themselves through their battery management systems, and how they are packaged and cooled. Optimal Energy has designed a system that will last seven to ten years. In addition, while modern motor vehicles are inherently computer systems on wheels, due to legacy issues there are some 50 to 100 CPUs per vehicle, and, with a completely new start presented by the entry of electric vehicle groups, such computing can be integrated into smaller more centralised units.

Meiring describes Optimal Energy's Joule as an urban electric vehicle, unlike the famous high performance Tesla, a high end sports car which retails for £100,000 per unit, and of which only a few units are produced a year. The Joule, of which eight demonstration units have been produced to date, meets all the UN safety standards as well as the Euro Ncap5 standards.

It is a five seater, with a top speed of 135 km/h. It is not really intended for taking trips to the Kruger Park, but is ideal for town driving since when the foot is lifted off the accelerator the motor become a generator. It makes it possible to drive the vehicle using a single pedal since the motor acts as a brake, and only under unusual circumstances is it required by the driver to apply additional braking.

The vehicle will have a range of 230 km based on the New European Driving Cycle (NEDC) or 300 km using the Urban Dynamometer Driving Schedule (UDDS). Meiring envisages the car costing some R240 000 to R280 000 excluding the battery, which he sees being supplied using a lease agreement.

Unlike the Tesla, which uses the equivalent of 6 500 laptop battery cells and achieves 0-100 km in 3,7 seconds, the Joule takes a rather pedestrian 15 seconds to achieve that speed, but it does achieve 0-60 in a respectable 4,8 seconds. The vehicle has an add-on option of photovoltaics in the roof, and if the car is left out in the sun all day this adds some 20–25 km a day of range. In other words, taking into account the additional cost, the option of photovoltaics is in the mag-wheel range of accessories, in terms of its use and market appeal.

The Joule has all the features of an electric vehicle, in that it produces zero emissions and is a quiet car. It can be plugged into a standard 220 V outlet at home to recharge overnight. Using a 400 V, 100 A fast charger, it could be charged in about half an hour, but it is likely that such chargers will be owned by garages, not vehicle owners. Taking into account that garages make more from their associated shops than from the refuelling service they provide, the turnaround time for recharging electric vehicles provides them with potentially pleasing opportunities.

Ten years ago it was recommended to avoid fast charging the battery pack for more than 20 percent of the time, as more than this would reduce its life, but such has been the evolution of battery technology that battery life is reduced now only if fast charging is used more than 60 percent of the time.

Meiring envisages using Port Elizabeth, East London or Durban as the manufacturing centre for the Joule which received positive reviews at the recent Geneva automobile show. The intent is to roll out a small fleet in South Africa. "We are also looking at a small fleet in London, which is one of the world's readiest places for electric vehicles."

How ready the market is for electric vehicles is demonstrated by the fact that at the equivalent show in Paris 18 months ago, Optimal Energy was one of only two serious electric vehicle companies exhibiting. "In Geneva every OEM had an electric concept car on show, in addition to another ten start-ups like us," Meiring says.

This trend is backed up by Frost and Sullivan research which predicts that by 2020, about 10 percent of the world's automobile fleet will be electric.

"The biggest change in the car market in generations is opening up new opportunities, and people are ready for it. South Africa's overall car market is about 700 000 units a year and we are targeting markets in this country, the UK and the EU."

Electric cars such as the Joule are expected to have about a seven year life cycle in terms of product development and, to be cost competitive, Optimal Energy will need to produce 200 vehicles a day. It will require about R6,5 billion in capital to establish such a plant. Optimal Energy is looking at starting mass production in 2013.

The stakes are high and South Africa's track record of taking the lead in commercialising high profile mass market technologies is poor, but the potential benefits are massive. "You only have to look at what it did to Italy, Germany, France and other countries to have their own car manufacturing brands."

The benefits of a large fleet of electric vehicles on the country's roads to Eskom and the electricity supply industry are significant as well. As the recharging will predominantly take place overnight during low demand periods, it will smooth out peaks and go straight to the utility's bottom line. "While reducing the requirement for imported oil, a million electric cars on the road can also be thought of as the equivalent of a new pumped storage hydroelectric scheme," Meiring suggests.

Sunshine and sewage – a holistic community service philosophy

By Peter Middleton

The CSIR's Dr Chrisna du Plessis, a principal researcher in the field of urban sustainability science and Thomas Roos, a research engineer and gas turbine specialist, have teamed up with several other CSIR specialists from diverse disciplines in a project to integrate concentrated solar power (CSP), biogas production from sewage, algal biodiesel production, fish farming and much more. At its core, the project aims to use biogas from sewage and air at 800˚C heated by a CSP plant to drive a gas turbine generator set.

Thomas Roos believes that it is time to think differently about our power solutions and, in particular, about the wasteful way that we humans use the resources around us. Motorcars are about 24% efficient in terms of energy use, new coal fired power stations, perhaps 40%, and even renewable energy sources like CSP plants have to dump significant percentages of the collected energy in condensing and cooling steam from the turbines. Add to that, emission and ash handling problems that result when using fossil fuels, and the nuclear waste problems and you get the sense that all of our main stream power solutions are cheap only because we are willing to accept low returns from our natural resources.

The CSIR's Forty Towns IRIP Project adopts an industrial ecology approach and takes as its core philosophy the interdependence of all things. "There is no waste in nature," says Roos. "Us humans have a tendency to adopt single intervention solutions. Our technologies are designed for one product output and anything that is not product, is waste that we have to be rid of."

In contrast, this project deliberately strives to interlink different technologies. "We are striving to focus on integrated solutions for municipal utilities, water and wastewater treatment and power generation," explains du Plessis. Much more than that though, the thinking follows the energy and waste chain through as many value adding systems as possible, so as to maximise resource use, minimise rejected waste and, like nature, make use of what we as humans routinely reject.

The starting point, according to du Plessis, is the community sewage treatment works. The idea is to set up business opportunities to take away some of the responsibility for waste-water treatment from the Municipalities. When you treat sewage you generally end up with methane, which has a global warming potential (GWP) of 21 times that of CO_2 over a 50 year period. By treating the solid waste sludge in an anaerobic digester, methane-rich biogas is produced and by burning this gas, you emit water vapour and CO_2, hence reducing the net environmental impact.

The biogas will be used to power an off-the-shelf gas turbine to generate electricity – but not on its own. "We believe it is possible to tune an energy plant to use concentrated solar energy to give scale, while biogas gives you the core availability," says Roos.

The project aims to produce dispatchable firm power, ie, power that is available both night and day and routinely – even when it rains for a week. The sizing is therefore not based on the community's power needs. Instead it is directly linked to the amount of biogas that can be produced from the community's waste, ie, linked to the maximum use of waste rather than the optimum production of power.

"The problems with CSP as a single solution, is intermittency, so the usual solution proposed is storage," explains Roos. But while storage is cheap, more infrastructure – more mirrors, bigger towers, etc – are needed to feed the storage, which is not cheap. It is far cheaper to use solar energy while it is available and use something else, eg, biogas, when it is not.

The proposed CSP plant will heat air to around 800˚C when the sun is shining, Then you burn a little methane to increase the temperature to 950˚C and put it through the gas turbine. This will produce electricity as a primary energy stream, but then you will still have exhaust air at 300˚C that can be used as input energy for value-adding downstream processes. At night, when the CSP plant is not producing energy, more methane will be needed, but the turbine itself need not be stopped.

From an environmental perspective, this is better than a CSP plant coupled to a steam turbine as it requires no water – and much better than a traditional gas-fired turbine as there are significantly lower percentages of combustion products in the exhaust stream.

"The gas turbine, with its higher exhaust heat temperatures, allows you to use a combined cycle, but instead of using the waste turbine heat to drive a second steam turbine, as you do with a power station, you can use the heat directly to fuel the local economy, for desalination, for driving chillers and local cold-rooms, etc," says Roos.

In small communities you might not always have industries that can use process heat at these temperatures, but you always have people and farms and you will always need refrigerators and cold rooms. So this heat is ideal for driving a double effect absorption chiller, which will produce chilled water to run local cold rooms for chilling milk or, if using ammonia, freezers.

But absorption chillers also dump heat, at say 60˚C. By blending this waste heat stream with a little heat from the higher temperature stream, you can produce heat at say 70˚C or 80˚C, ideal for a multi-effect distillation system for purifying saline and low quality water, suggests Roos.

A Turbec 100 kW gas turbine installed at the CSIR as the starting point of the Forty Towns Project. The intention is to drive the turbine using air heated to 800˚C by a CSP plant and methane, recovered using anaerobic digestion of sewage sludge.

Lower grade heat is then useful for aiding biological processes, for accelerating algal growth, for example, or maintaining stable water temperatures at a fish farm.

Which takes us back to the sewage works.

"Effluent, after primary separation, consists of solid sludge, which goes into an anaerobic digester to produce biogas, and the liquid supernature, which is nutrient-rich and ideal for several biological applications," says du Plessis. The supernature is passed through a membrane reactor, to channel the nutrient streams and to begin purifying the water, clean water being an obvious key product. The membrane reactor allows nutrients to be extracted, which, together with the CO_2 from the gas turbine, are used as feed for micro-algae – and algae is an ideal feedstock for making biodiesel and high value pharmaceuticals.

The clean water coming out of the algae plant, along with the low grade waste heat, is ideal for fish farming. Glycerol, a by-product of biodiesel production, is fed back into the anaerobic digester to increase the efficiency of methane production. You also get a protein rich biomass from the biodiesel plant, which can be used to make fertiliser or fish food. Waste products from the fish are, in turn, ideal for hydroponic farming, which uses less land, less water, and virtually no pesticides.

Each output from one system becomes an input to another. Every one of these processes has been tested in isolation, but no one has put a whole system together. "Implementation requires a complex multi-disciplinary approach, which makes funding problematic," says Roos. "Funders like answers to their own questions and see significant risks when too many questions are being answered. We see a big risk in not going this route, though. The pressures of climate change, resource scarcity and water availability, mean that we have to do things differently in future – and the whole point of a research institution is to work out how things can be done differently."

The project is currently being funded internally by the CSIR, but private partners are needed to take the project into reality. A plug-and-play 100 kW gas turbine, along with a methane compressor and all of the necessary electronics for grid connectivity, are in place. A site had been set aside for the CSP tower and heliostats.

A full pilot system, based on a 600 kW turbine and the associated methane and CSP generators, will cost around R73-million, including both capital investment and research and engineering costs, estimates du Plessis. Over three years, this amounts to about R24-million per year. The pebblebed investment? R2-billion every year.

"By squeezing every drop of energy out of all of the available resources, including the waste streams, the system's overall energy efficiency becomes very, very high. We envisage achieving a total combined electrical and thermal efficiency approaching 90%," says Roos. "And based on a preliminary economic model and the REFIT tariffs, we are sure that this system can turn a profit for a private investor," he concludes.

Medupi, if we assume current estimated costs of R120-billion for the 4 800 MW plant, comes in at around R25 000 per kW installed, before any maintenance and fuel costs are factored in, ie equivalent to R15-million for 600 kW.

In a 2005 case study in Antrim Area Hospital near Belfast in Ireland, a 660 kW Vestas wind turbine was installed at a total project cost of £495 000, ie about R6-million. When you consider that wind will have a substantially lower capacity factor than either Medupi (four fold) or the Forty Towns Project solution, is R25-million per year for three years such a huge investment?

Investment in this holistic solution also offers much more than just kilowatt hours. Clean sewage, new jobs and a variety of new industries in small towns are 'by-products'.

Thomas Roos, research engineer and gas turbine specialist, and Dr Chrisna du Plessis, a principal researcher in the field of urban sustainability science.

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Work progresses on the Bloodhound project

For Royal Air Force pilot, Andy Green's Bloodhound SSC project is forging ahead as he and his team attempt to build a car that will travel at over a thousand miles an hour (1 600 km/h) across a salt pan in South Africa later this year.

The project (www.bloodhoundssc.com) is aimed at encouraging and fostering an interest in science and engineering among students throughout the world and, as part of its activities, Green has set up a range of projects for teachers and students to help them understand the fundamentals of design and engineering.

Progress on the project is relatively slow because so much of the vehicle must be purpose built. According to Green, the wheel profiles have been chosen and the solid aluminium wheels will have a special tread profile to provide the right amount of grip.

If there is too much grip it will cause the vehicle to roll while too little grip will make it uncontrollable. For the test runs, the Bloodhound will use jet fighter aircraft tyres for speeds up to 400 km/h.

To control the car at high speeds, small wings – or winglets – will be used to trim the aerodynamic loads on the car (that are up to 12 tons per square metre). These loads must be kept balanced because too much down force will crush the car while too little would cause it to lift off. The Falcon hybrid rocket chosen to provide the thrust will be clamped on at the back end and will have a quick-release connector at the front. The engine will take the car from 565 km/h to 1 600 km/h in about 20 seconds. At the end of the first run the rocket has to be replaced for the return run within an hour, hence the need for the quick-release connector.

The maximum load of the brake parachutes has been fixed at nine tons, giving the car a peak deceleration of minus 3g. The manufacture of the car has been broken down into 300 sub-assemblies with the front half of the car being made from carbon fibre and the rear fuselage being made from steel and aluminium.

At the moment, the Bloodhound project is delivering information to 3 500 schools and colleges in Britain and Green says that more and more educational facilities are expressing an interest in working with the group so that they can help to inspire the next generations of engineers.

The land speed record attempt will be made at Verneuk Pan in the Northern Cape – coincidentally at a site chosen by Malcolm Campbell for his land speed record attempt in 1929 in a Blue Bird.

Images: www. dexigner.com

Sun's explosions are making music

The Sun produces eerie musical harmonies in its magnetic field in the outer atmosphere where huge magnetic loops, known as coronal loops, coil away and vibrate like strings on a musical instrument.

In other cases these magnetic fields behave more like sound waves that travel through a wind instrument.

Astronmers at the University of Sheffield used satellite images of these loops – which can be over 100 000 kilometres long – to recreate the sound by turning visible vibrations into noises and then speeding up the frequency so it is audible to the human ear.

Professor Robertus von Fay-Siebenburgen, head of the solar physics research group at Sheffield University says that the sounds were strangely beautiful and can be construed as music because it contains harmonics.

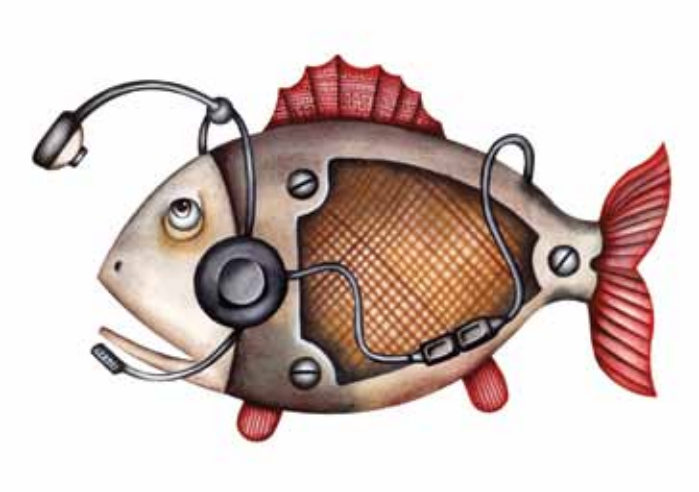
The coronal loops are thought to be involved in the production of solar flares that fling highly charged particles into space and, in the process, creating a phenomenon known as space weather.

The coronal mass ejections can result in space storms and have a catastrophic effect on Earth, destroying electronic equipment, overheating power grids and damaging satellites.

The National Aeronautics and Space Administration has already warned that the Sun's activity is starting to increase after a sustained period of low activity and it appears to be on schedule to produce unprecedented levels of magnetic energy by 2013.

Fay-Siebenburgen says that the "music of the sun" might provide new ways of understanding and predicting solar flares before then occur. He says that coronal loops vibrate from side to side because they are "plucked" – like a guitar string – by the blast waves from explosions on the surface of the Sun.

Noise pollution threatening fish



Thousands of species of fish are apparently being threatened by excessive levels of noise pollution in the oceans of the world. Scientist, Dr Hans Slabbekoorn of Leiden University says that noise pollution is affecting the ability of fish to reproduce, communicate and avoid predators.

Working with colleagues in the Netherlands, Germany and the United States, Slabbekoorn says that all species studied during the survey are able to hear sounds either by an inner ear or through a lateral line that runs along the fish's sides.

He says that generally fish hear best within the 30 to 1 000 Hz range although some specially adapted fish can hear sounds between 3 000 and 5 000 Hz. And, he says, the extent of noise pollution in the oceans is rising rapidly.

For instance, about 80 percent of global freight transport takes place in motorised vessels moving around the seas and the global shipping fleet comprises about 1,2-million vessels.

Added to this, underwater sounds are produced by fisheries and the oil and gas industries.

Studies of the Atlantic herring, the cod and blue-fin tuna prove that these species flee sounds and school less in noisy environments.

Fish generally make sounds when fighting over territories, competing for food, during spawning aggregations and when under attack from predators.

The work by Slabbekoorn and his colleagues shows that the noise pollution levels in the oceans prevent fish from hearing each other and communicating effectively.

This, he says, could directly contribute to the declining levels of fish stocks around the world because noise pollution can interrupt reproduction by causing stress, restrict a fish's ability to find a mate or prevent it from venturing into the spawning sites.

Water levels 100 times higher on the Moon?

Scientists have found that there is about 100 times more water in minerals on the Moon than previously thought. A United States-led team of researchers has analysed the mineral, apatite, in lunar rocks collected by the Apollo space missions and from a lunar meteorite found in North Africa.

Lead author of the study, Francis McCubbin from the Carnegie Institution for Science, based in Washington DC, says that the water content on the Moon ranges from 64 parts-per-billion to five parts per million.

The water content in the rocks on the Moon would be about 2,5 times the volume of water in the Great Lakes of North America or the equivalent, says McCubbin, of covering the Moon in metre-thick layer of water.

Contemporary science says that the Moon was probably formed when a planet about the size of Mars crashed into the Earth about 4,5-billion years ago and the high-energy impact produced a large volume of molten debris that eventually cooled to form the Moon.

At the time, scientists say, there was a magma ocean on the surface of the Moon and it was this magma that contained water. However, the Moon erupted in fire fountains of volcanic activity and most of the water actually evaporated. McCubbin says that the lunar rocks brought back from the Moon by the Apollo missions have been studied for years and, while the initial findings declared that it was completely dry, later studies found traces of water.

For instance, a team of scientists refuted the initial findings and used a method of secondary ion mass spectrometry to show that there was clear evidence of water in lunar volcanic glasses – or pebble-like rocks that ended up on the Moon's surface after the volcanic eruptions.

The water was measured at 46 parts per million.

Then, earlier this year a radar experiment on India's Chandrayaan-1 lunar spacecraft found thick deposits of water-ice near the Moon's north pole. Then, McCubbin and his team re-evaluated the lunar locks and concentrated on apatite, the water-bearing mineral of the rocks, which also happens to be a major component of tooth enamel and bones.

He says this mineral has a better chance of containing water than other minerals. This analysis led to the conclusion that the Moon contains about 100 times more water than previously believed.

Ridge prevented rapid Antarctic ice flows

Pine Island Glacier – one of the largest glaciers in Antarctica – has gradually been accelerating as ice flows from it. Scientists say that the cause of the increased flow is that the glacier once sat firmly on a ridge, but has now become detached from it causing the more rapid movement.

A team of researchers has conducted a range of underwater surveys using an unmanned submarine deployed under the glacier. According to co-author of the report published in *Nature Geoscience*, Pierre Dutrieux of the British Antarctic Survey, the ridge is about 400 metres high.

He says that until recently the glacier was sitting on top of this ridge and the friction of the ridge was restricting the ice flow from the glacier. When it became detached from the ridge, the flow was able to accelerate significantly.

Dutrieux says that the glacier is located in an area where there has been rapid melting of land ice causing it to flow into the ocean. Researchers say that the accelerating flow of glaciers in West Antarctica is contributing about ten percent to the observed rise in the mean global sea level.

Satellite measurements last year showed that the surface of the ice on Pine Island Glacier was falling at the rate of about 16 metres a year and was thinning at a rate that was four times faster than it was a decade ago.

Dutrieux says that the discovery of the ridge is an important part of the jigsaw puzzle of factors that could be changing the ice dynamics of the region. He says that the atmospheric forcing – the temperature at the surface – is not warm enough to cause the melting.

Apparently scientist had attributed the higher ocean temperature for the melting of the ice shelf below. So to gather data, the researchers launched an Autonomous Underwater Vehicle (AUV) on six survey missions beneath the Pine Island Glacier.

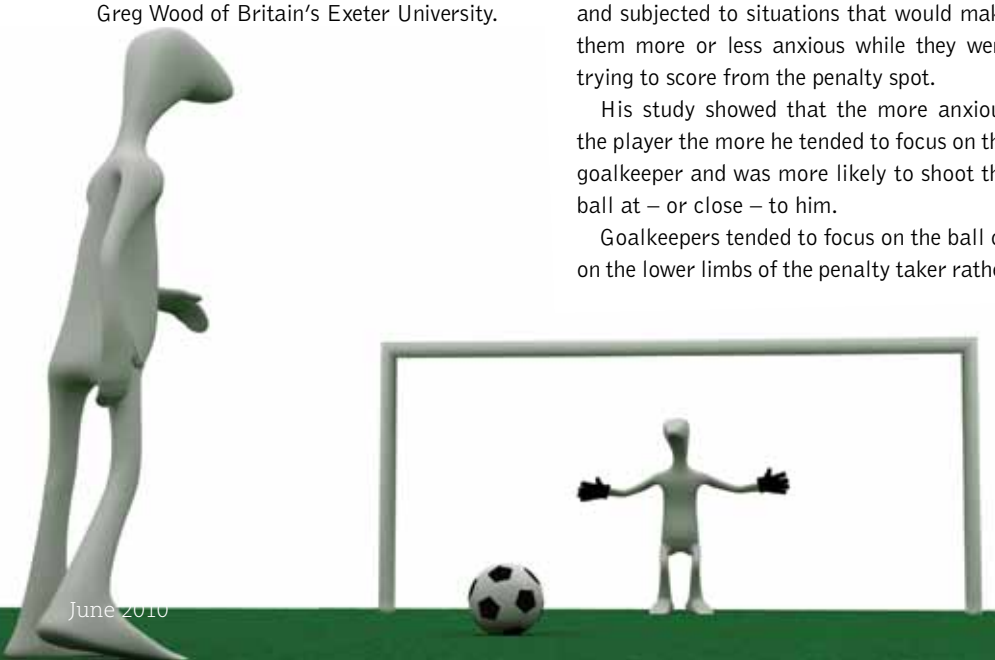
The seven-metre long vessel carried a multi-beam sonar system that allowed it to capture data and build up a three-dimensional map of the ocean bed below and the ice above. It also measured salinity, temperature and oxygen concentrations in the seawater.

Dutrieux says that the data showed that there is relatively warm water beneath the ice so the warmer water could be melting the base of the ice shelf.

But, he says, there has also been a change in the water properties that were grinding the shelf from below leading to the change in the flow.

Focus on the kick and not on the 'keeper'

Soccer stars confronted with taking a penalty during the FIFA World Cup should ignore the goalkeeper completely and rather focus on where they intend to kick the ball according to sports psychologist and scientist, Greg Wood of Britain's Exeter University.



He says that players taking penalty kicks are under pressure and should work to remain calm and not be distracted. Woods and his team studied university-level soccer players who were fitted with eye-tracking technology and subjected to situations that would make them more or less anxious while they were trying to score from the penalty spot.

His study showed that the more anxious the player the more he tended to focus on the goalkeeper and was more likely to shoot the ball at – or close – to him.

Goalkeepers tended to focus on the ball or on the lower limbs of the penalty taker rather than on his face or eyes. Woods says that the more a goalkeeper attempts to distract the player the more likely the kicker will focus on him and kick the ball in his direction.

South Africa goalkeeper, Bruce Grobbelaar – who played for Liverpool – confirmed Woods' findings saying that he used his spaghetti legs routine to distract players and, during the 1984 European Cup final against Roma it was this routine that help the team win the trophy.

Grobbelaar says that spectators accused him of being unfair to Roma's players but he was testing their concentration under pressure. Woods says that the negative pressure of history can also affect a player's ability to score from the penalty spot.

Teams such as England, Yoguslavia, Mexico and Switzerland have lost all of the World Cup penalty shootouts they have played in in the past.

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DoC could smash migration to digital terrestrial television

It seems astonishing but the Department of Communications is clearly battling to communicate itself and its position clearly, particularly when it comes to the standards that have been adopted for South Africa's digital terrestrial transmission.

There are many different references by the DoC and a number of other state organisations, President Jacob Zuma's Cabinet, the South African Development Community and the South African Bureau of Standards that South Africa has adopted the Digital Video Broadcasting – Terrestrial (DVB-T) standard.

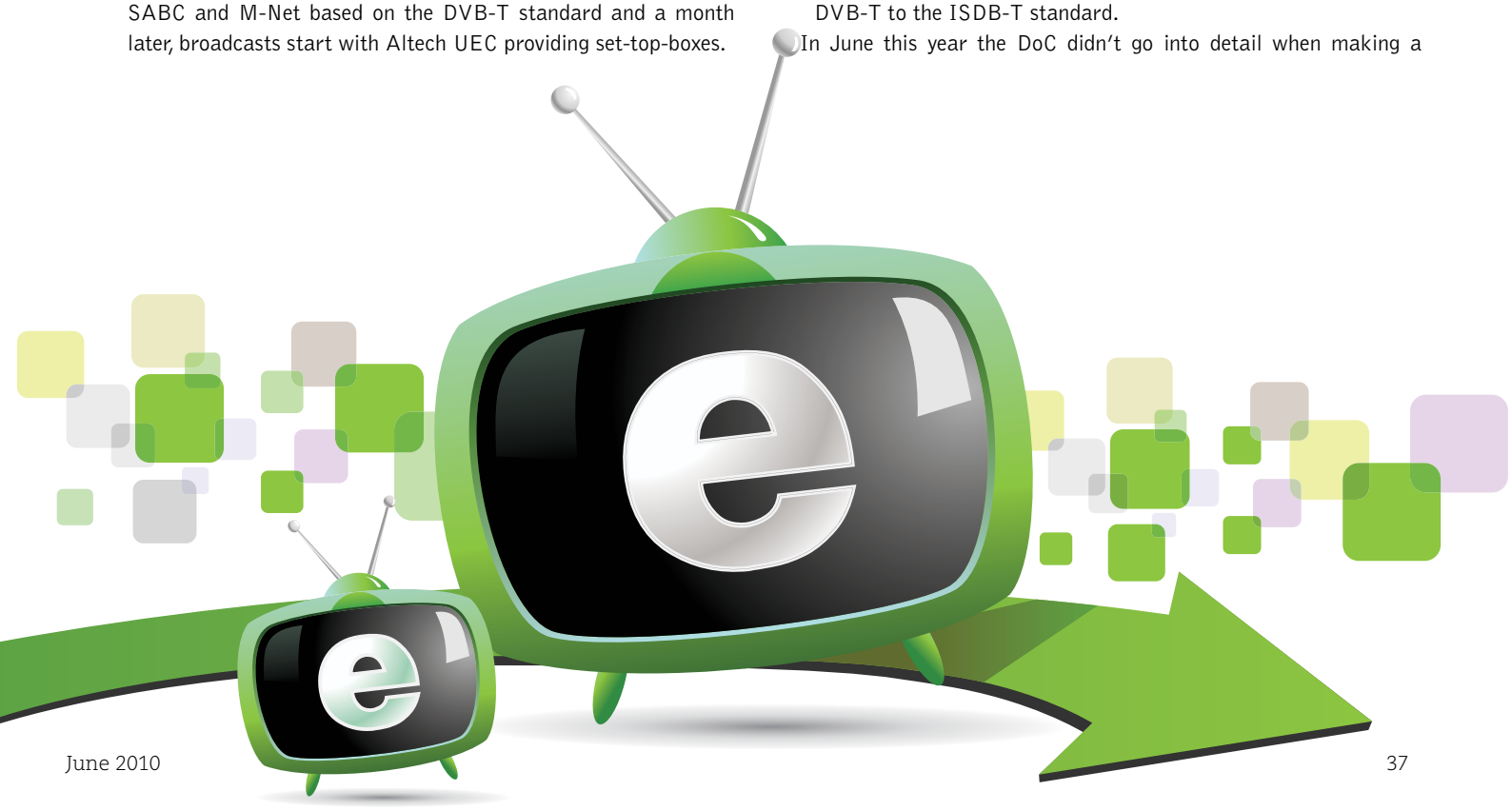
In fact, a document by Altech UEC's business development director, Anton Lan that was sent to the Director General of Communications, Mamodupi Mohlala after the SADC Digital Terrestrial Television (DTT) Standards symposium clearly traces the government's position.

- In June 2006 South Africa became a signatory to the International Telecommunications Union (ITU) Geneva 06 regional agreement and even then the DVB-T standard was adopted.
- In November of the same year, the Digital Migration Working group appointed by the DoC recommended the adoption of DVB-T and in September 2008, after further investigations, the Minister of Communications published the Broadcast Digital Migration (BDM) Policy for South Africa, which confirms the adoption of DVB-T.
- In October that year, the Independent Communications Authority of South Africa (ICASA) granted trial broadcast licences to SABC and M-Net based on the DVB-T standard and a month later, broadcasts start with Altech UEC providing set-top-boxes.
- In July 2009, the SABS published the South African National Standard 862:2009, the standard for free-to-air digital terrestrial set-top-boxes based on the DVB-T standard.
- A month later in August 2009, the SADC Regional Broadcasting Digital Migration Working Forum resolved to use Geneva 06 as the basis for planning migration throughout the region and to adopt DVB-T as the standard, along with a proviso that enables all countries in the region to upgrade to DVB-T2 at a later stage.

So you can imagine the uproar and the outcry when the Department of Communications made some astonishing statements:

- That it was considering changing from the DVB-T standard (used in 120 countries around the world) to the Japanese and Brazilian standard (that has never been deployed anywhere in the world in the 8MHz spectrum. This Integrated Service Digital Broadcast Terrestrial (ISDB-T) standard is used in Japan at 6 MHz and in Brazil at 7 MHz and that's all.
- The Minister of Communications, Siphiwe Nyanda told delegates at the Digital Terrestrial TV Standards Symposium that South Africa does not have a digital video broadcasting standard.
- Furthermore that the DoC was considering switching from the DVB-T to the ISDB-T standard.

In June this year the DoC didn't go into detail when making a



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presentation to Parliament's Portfolio Committee on Digital Migration other than to mention that the DVB Group (developed in Europe and widely used in 120 other countries, ratified by the SADC and currently in use in South Africa) had create a new generation standard, DVB-T2.

It also mentioned the ISCB-T standard developed by Japan, which it claimed "offered innovative solutions that warrant consideration". The DoC standpoint on this Japanese standard flies in the face of all other research work that has been undertaken by the people who are working on the migration of the analogue broadcast signal to a digital signal.

Altech UEC, with wide-ranging experience in the field says that there is no compelling reason to change from the DVB-T standard and, worse than that, any changes would dilute South Africa's existing intellectual property, would more than double the costs for set-top-boxes and would result in hundreds of millions of rands already spent on migration being lost entirely.

It would also delay the migration by between three and five years and would mean that South Africa was the only country in the SADC region that had deployed this standard, in defiance of the agreements already reach with other member states.

It seems one of the most illogical and inane concepts ever put forward by the DoC – which, in its defence has stated that ". . . has yet to make a decision on which standard to use for South Africa's digital TV. . .".

This comes at a time when the country has just less than 18 months to go before the 1 November deadline to stop broadcasting analogue signals. Nyanda told the Portfolio Committee that he was still awaiting a final report on the outcome of a government and industry colloquim on this subject that was held in April.

As e-tv's chief executive, Marcel Golding was quick to point out at a press conference in Johannesburg a week after the Portfolio Committee hearings, there are no problems at all with the DVB-T standard.

At the same press conference, M-Net's Patricia Scholtemeyer said that M-Net had been running DVB-T trials for more than two years and these have been extremely successful. M-Net is poised to launch a commercial digital terrestrial television (DTT) service.

The DTT transmission network is in place and the manufacturers are ready to proceed with commercial production of the set-top-boxes.

The specifications for these devices have been set down and approved by the South African Bureau of Standards and ICASA has already published the DTT Frequency Plan.

Now the DoC is suggesting that the standard should be switched from one that is developed, tried and tested to a new standard that is unknown and untested in the 8 MHz frequency spectrum.

Neels Smuts, a fellow of the South African Institute of Electrical Engineers and a person who has spent more than 35 years working in the television industry expressed his own concerns in a document sent to Themba Piri at the DoC.

"I am concerned that a properly considered and concluded process for the adoption of the DVB-T standard as the national standard for digital terrestrial television broadcasting in South Africa may now be discarded in favour of the ISDB-T standard, apparently as a matter of haste and without comparable considerations, deliberations or consultations carried out for the adoption already made," he wrote.

"I am convinced that the DVB-T standard already adopted is the right choice and that there are substantial long term advantages in using the DVB-T standard that will benefit South Africa and that do not apply to the ISDB-T standard." He goes on to list these advantages:

- The DVB-T standard has made far greater penetration in the global market where it is used by 120 countries around the world. This results in a great deal of competition, large economies of sale in terms of set-top-boxes and chipsets.
- Greater investment is made in research for this standard because it is widely deployed and this will further reduce prices, improve capacity and encourage the development of new features. A smaller market will result in limited development and the risk that, at some time in the future, it may be dropped altogether.

His concerns are backed by those from Altech UEC's Anton Lan who says that switching the standard at this late stage will offer no direct benefits but will require that new set-top-box specifications are developed, new broadcaster rules of operation and middleware specifications will have to be devised and additional frequency planning and co-ordination will be needed.

He is quick to emphasise that Altech UEC is a "technology neutral" company and has been developing set-top-boxes for the past 15 years working predominantly in the DVB space. He concedes that for the non-technical person the two standards seem to offer comparable functionality. However, a transition to ISDB-T is extremely risky and will mean significantly higher costs for taxpayers because:

- ISDB-T has not been deployed at 8 MHz and, given that there are fewer users, the prices of all components will be significantly higher.
- There are no ISDB-T skills in South Africa while hundreds of millions of rands have been spent by broadcasters, signal distributors and manufacturers on DVB-T equipment and developing skills in this country.
- The adoption of the ISDB-T standard would necessitate the skills being imported to South Africa from Japan and Brazil, benefitting those two economies but doing little or nothing for the local economy.

Altech itself has developed considerable skill in working with the DVB and has even developed its own middleware stack as part of the DVB-T trials. The company has reiterated to the government that it will share this technology with South African companies and the

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Middleware is apparently the key technology element that will enable electronic government services and lead to significant growth in the information, communication and telecommunications sectors. The stack has been built using open standards with a defined application-programming interface and a software development kit to enable third-party software developers to use their skills to build new value-added applications. The local intellectual property in middleware means that in can be used by South African companies to develop and innovate new applications that are completely homegrown.

Altech says that while the DoC has created policies aimed at encouraging innovation and development of local intellectual property, it is now considering the ISDP-T standard that will rely on using Japan and Brazil for development, isolating local developers entirely and undermining the investment already made in intellectual property for the DVB-T standard.

Altech UEC has already demonstrated an Internet web browsers, e-mail and digital content transfer running through the set-top-box and complying with the existing SANS 862:2009 standard using a 3G/GPRS modem.

The company has committed itself to:

- Licencing hardware and software intellectual property to other South African companies;
- Sub-contracting elements of the manufacture of subsidised set-top-boxes;
- Maximising the participation of local companies in the supply chain;
- Developing small, medium and micro-enterprises for after sales support, installation and distribution.

By changing the standard to ISDB-T all these advantages would be lost for years to come and, perhaps, permanently.

e-tv in its submission to the Portfolio Committee on Communications stated that it has "grave concerns" about the appropriateness of contemplating a change in the standard now and points out that it appears as though the DoC has already made up its mind that the standard should be changed, regardless of the far-reaching impact this will have on all South Africans.

It points out several fundamental points:

- South Africa and the rest of Africa have already adopted the DVB-T standard. E-tv says that based on comments by an unnamed senior DoC official at the April symposium, the Department mistakenly believes that a different standard for digital broadcasting can be entertained as South Africa has not yet chosen a standard. This is completely untrue.
- It lists 13 instances where government and stakeholders between 2002 and 2009 have formally adopted the standard.
- ISDB-T is not technically superior to the DVB-T standard and there is no compelling technical reason to change the DVB-T standard.
- The investment already made in DVB-T will be lost and the value of the intellectual property gathered over years and years of research will be valueless and wasted.
- Consumers will be prejudiced because they will have to pay between two and three times more for the set-top-boxes than those that are currently available and will have no discernible benefit form the additional expenditure.
- The entire launch of the DTT network will be delayed by at least three and perhaps five years and this will have a direct impact on the digital dividends expected to accrue from the migration process.

In its conclusion, e-tv says that there is no good or justifiable reason for even considering a change to the existing and adopted standard.

Signal distribution company, Sentech, in its submission to the Parliamentary Committee on Communications says that it has already achieved a roll out of digital transmission equipment that provides 33 percent population coverage and by March next year this will reach 66 percent. The capital expenditure allocation is R1-billion from government and it has received R525-million of this amount. In addition, the operational expenditure allocation is R330-million and it has received R100-million already.

M-Net was prohibited from testifying before the Parliamentary Committee on Communications and had to rely on a written submission. In this submission, it too raised its "grave concerns" that the DoC was considering changing the standard in direct conflict with the Cabinet's decision to adopt DVB-T.

It says that the DoC is considering the change despite the fact that a detailed comparative analysis of the technical capabilities of all standards was undertaken by two independent ministerial advisory bodies in 2002 and 2005 and both recommended that the DVB standard should be adopted and used. Moreover, the DoC itself accepted those recommendations and adopted DVB-T as the relevant standard for the country, as did the entire SADC region.

M-Net says that its technical experts have considered the claims made about the different standards – particularly from Brazilian and Japanese experts with vested interests in getting the technology used – and have reached the conclusion that there is no direct benefit in switching from DVB-T to ISDB-T, but there are significant risks and additional costs.

CPD Overview

WATTnow, in conjunction with the South African Institute of Electrical Engineers (SAIEE), has launched this programme for engineers who need to meet their professional development commitment by securing Continuing Professional Development (CPD) credits. In terms of the renewal of registration requirements, all professional electrical engineers must earn five CPD credits a year. Failure to certify CPD credits could jeopardise renewal of their registration.

WATTnow publishes articles in each issue that qualify readers for Category One CPD credits, which require engineers to respond to in-depth questions posed on articles that are specially designed and validated to provide CPD. Engineers using the system will accumulate between 0.1 and 0.3 CPD credits if all the questions are answered correctly. Ten such articles are published annually so at least one CPD credit can be obtained by this method. The articles in **WATTnow** are independently validated by the SAIEE, which determines the exact value of each credit applicable to each issue of the magazine.

In future, **WATTnow** will produce a series of video broadcasts of up to six lectures annually on topics that have been validated for CPD by the SAIEE. These lectures will be filmed and edited by a **WATTnow** production team and converted to either CD or DVD disks before being distributed free-of-charge to members of the **WATTnow** CPD Programme.

A series of appropriate questions will be included on the CD or DVD and members of the programme can submit their answers directly to **WATTnow** by e-mail, on-line or by fax. The filmed presentation will qualify the user to claim credits in the Category One section, which makes attendance of a conference at least once a year mandatory.

The SAIEE will issue each member with an official certificate recording the exact number of credits gained by each individual in any given year.

The **WATTnow** CPD Programme is based on a subscription service that will cost non-members of the SAIEE R2 400 a year while members of the institute will pay an annual subscription fee of R1 000.

This programme offers all members of the **WATTnow** CPD Programme a one-stop-shop to participate in and comply with the professional development criteria laid down by ECSA and ensure that all professional engineers can maintain their status without having to search around for sufficient credits to meet the ECSA requirements.

For further information visit www.wattnow.co.za

Nuclear plants will help meet emission reduction targets

If South Africa were to build a new nuclear power plant to generate electricity, the country might reach its ambitious target of cutting carbon emissions by 34 percent, claims the Nuclear Energy Corporation of South Africa (Necsa).

According to corporation representative, Andrew Linington, renewable technologies such as wind and solar will not be able to provide a dependable baseload energy supply.

He says that new nuclear energy plants will have a lifespan of between 60 and 80 years and can be supported in South Africa. Necsa has embarked on a project to train engineers, artisans and technicians in nuclear energy to ensure that the appropriate skills are available to support new nuclear plants.

He says that South Africa has large resources of uranium but added that the government should adopt an integrated approach to uranium supplies so that supplies can be supplied by other member states of the South African Development Community.

Necsa has proposed that government gives the go-ahead for a fleet of new nuclear plants to provide South Africa's baseload capacity in the years ahead. However, Linington conceded that nuclear plants are expensive and that it "all boils down to what the country can afford."

Predictably, green activists – who are vehemently opposed to nuclear power – urged government to reject nuclear power in its entirety. Smart Green Prosperity representative, John Joslin claimed that future generations of South Africans will be prejudiced if nuclear power plants are built.

He says the cost of any fuel-based technology is always higher than the costs of renewable energy.

SA seeks to create 300 000 green jobs

Environmentally friendly 'green' projects could create about 300 000 jobs in South Africa according to South Africa's Economic Development Minister, Ebrahim Patel. He says most of these jobs would be created in the renewable energy sector.

Patel says the Industrial Development Corporation has R11,7-billion in funding over the next five years that is earmarked for green industries and of this some R8,5-billion is for renewable energy and bioethanol projects.

He urged South African industrialists and foreign investors to scale up their efforts in green projects, moving from small-scale developments to much larger ones that will have a broad impact on economic development.

According to Patel, the Economic Development Department will soon finalise the percentage target of how much renewable energy will be delivered to the national grid based on the renewable energy feed-in tariff.

Then it plans to focus on speeding up the local manufacture of components and increase investment in developing local skills for this sector. He says that there needs to be a greater degree of co-ordination between various government departments, government-owned enterprises and public-private partnerships.

He has invited representatives from private companies and from labour unions to join the government in meeting the challenges that the green economy offers.

Windy city gets power from turbines

Port Elizabeth – known as the 'windy city' in South Africa – has connected its first wind turbine to the grid as part of the Coega wind farm project. The 1,8 MW turbine is the first of 25 that will eventually be producing electricity for the Nelson Mandela Bay municipality.

Belgium company Electrawinds invested R1,2-billion in the project that will see all 25 turbines eventually providing 5,7-million kilowatt hours of electricity from wind.

According to company managing director, Luc Desender this is enough electricity to provide power for 1 700 households.

The project is only due for completion early next year, but once all the turbines are operating efficiently the Nelson Mandela Bay municipality will receive about 45 MW of renewable energy from the wind farm.

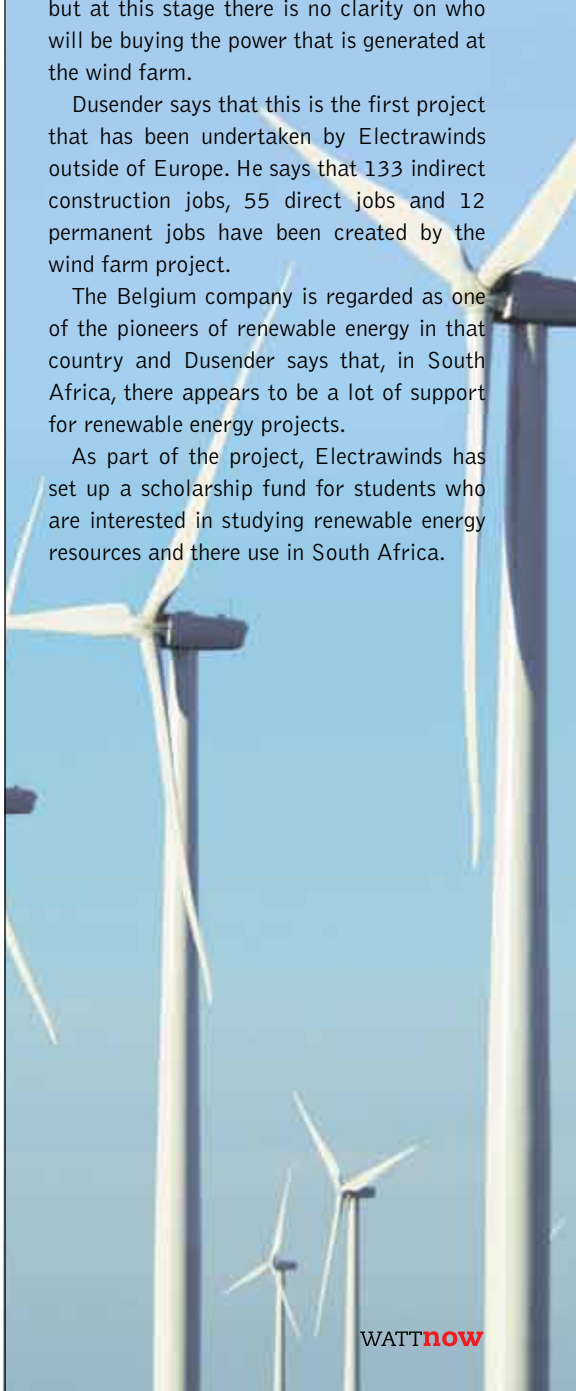
The electricity will be added to the national grid and distributed by the local council to households in the area.

Apparently Electrawinds is in the process of completing the power-purchase agreement but at this stage there is no clarity on who will be buying the power that is generated at the wind farm.

Dusender says that this is the first project that has been undertaken by Electrawinds outside of Europe. He says that 133 indirect construction jobs, 55 direct jobs and 12 permanent jobs have been created by the wind farm project.

The Belgium company is regarded as one of the pioneers of renewable energy in that country and Dusender says that, in South Africa, there appears to be a lot of support for renewable energy projects.

As part of the project, Electrawinds has set up a scholarship fund for students who are interested in studying renewable energy resources and there use in South Africa.



Canada to phase out coal-fired power stations

Canada will phase out its coal-fired power stations and plans to switch to natural gas as a feedstock for electricity generation according to the country's Environment Minister, Jim Prentice.

The new standards for power generation will be finalised early next year and will force electricity producers to switch to new generation technologies in order to lower greenhouse gas emissions.

Canada has 51 coal-fired power stations producing about 19 percent of the country's electricity and about 13 percent of its greenhouse gas emissions. Some 33 power stations will reach the end of their economic lives by 2025.

However, unless the operators make substantial investments to cut emissions in these older power plants they will be shut down ahead of 2025.

Prentice says that once a power plant comes to the end of its economic life, it will have to meet the new standards for shut down. There will be no carbon trades, no offsets and no credits.

Canada has been repeatedly criticised by green environmentalists for not doing enough to protect the environment and for allowing emissions of greenhouse gases to rise steadily over the past 20 years and more.

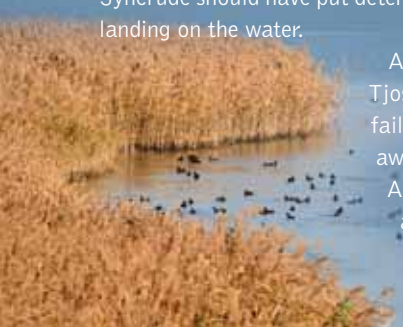
The new environmental laws are expected to reduce emissions by 15 megatons, the equivalent to taking about 3,2-million cars off Canada's roads.

The country's new regulations are much stricter than those in the United States where the only regulation for carbon dioxide emissions from coal-fired power stations applies to the 10-state Regional Greenhouse Gas Initiative in the north-eastern part of the country.

TransAlta Corporation – Canada's largest operator of coal-fired power plants says it supports the new standards as long as these do not threaten the stability of Canada's electricity supplies.

Company fined for killing 1 600 wild ducks

Canada's largest oil sands producer, Syncrude, has been fined C$800 000 for killing 1 600 wild ducks that landed on a toxic tailings pond in Northern Alberta in 2008. The court ruled that Syncrude should have put deterrents in place to stop wild ducks from landing on the water.



Alberta Provincial Court judge Ken Tjosvold ruled that the company had failed to take steps to keep water fowls away from the tailings pond at its Aurora mine. The company claimed a spring snowstorm had prevented it from having sound cannons and scarecrows that are usually used to keep birds away.

The tailings ponds are toxic and contain wastewater and clay loaded with heavy metals and residual oil.

Syncrude, a joint venture comprising Canadian Oil Sands Trust, Suncor Energy, Nexen, ConocoPhillips, Murphy Oil and Mocal Energy, says it is very disappointed with the ruling because it should not be found guilty as an act of God (the snowstorm) had prevented it from keeping the ducks off the mucky water.

The company is considering whether to appeal the verdict.

The case has heightened international concern about the environmental impact of oil sands projects with environmentalists arguing that multi-billion dollar mining developments such as these cause irreparable damage to wildlife, land, air and water.

Hydropower a solution for Africa?

Tariff structures for hydro-electricity projects in various African countries should be made more attractive for investors and the red-tape surrounding business licences and environmental impact assessment studies should be streamlined, claims hydropower consultant Leonard Kassana.

He has recently completed an assessment for the tea industry in Kenya, Uganda, Tanzania, Rwanda and Malawi. Kassana estimates that Africa has the capacity to produce about 100 GW of hydro-electric power.

He visited eight small hydropower plants at sites in five countries as part of his research. These included the 2,8 MW Gura small hydropower and 0,85 MW Tagabi projects in Kenya and the 4,5 MW Giciye small hydropower undertaking in Rwanda.

Kassana claims that technical capacity building is a key in these developments. Local tea companies are apparently investing in the small hydropower projects and this is clear evidence that investors are keen to improve electricity generation using what he calls "this mature technology".

Later this year a special conference on hydropower will be held in Johannesburg where a number of international experts have been invited to present papers on various different aspects of hydro-electric power generation.

New power line to link east African countries

A new power line linking Zambia, Tanzania and Kenya is due to be built at a cost of $780-million. Construction is due to begin next year resulting in the line being fully operational by 2015 according to Israel Phiri, manager of Zambia's Office for Promoting Private Investment.

The 1 447-kilometre long, high voltage transmission line starts at Serenje in southern Zambia, runs to Mebya and Arusha in Tanzania and terminates in Kenya's capital, Nairobi.

Phiri says the Zambian line will cost about $380-million, the Tanzania line a further $310-million and the final section to Nairobi, $90-million.

Meanwhile, the World Bank has approved a $330-million loan for Kenya to expand its national grid and to provide some seed capital for the geothermal power generation project being planned in the country.

Kenya currently relies on hydro-electric power to generate about 70 percent of its electricity but the country is prone to power shortages and cuts, exacerbated when droughts occur, because the country's dam water levels drop sharply.

The $330-million loan forms part of the planned $1,4-billion investment in the electricity sector by the government. The World Bank claims that a lack of reliable energy supply has a direct impact on lowering sales revenues in the country by about seven percent a year.

This, it says, reduces Kenya's growth rate by about 1,5 percent annually.

The country's primary electricity generating company, KenGen, generates about 1 000 MW of electricity, equivalent to about 80 percent of the country's demand, and about 700 MW of this comes from hydro-electric schemes.

Kenya is keen to diversity its sources of electricity and hopes to use geothermal and wind energy to minimise its reliance on hydro-electric power. Vast reserves of steam are locked under the Great Rift Valley and it is this steam that will be used to generate about 5 000 MW of geothermal power by 2030.

Exxaro to diversify into power generation?

Diversified mining group Exxaro is planning to generate 350 MW of clean electricity using solar, wind, gas and 'clean coal'. The first project is likely to be operational within the next two years.

According to company manager, Thomas Garner, the Exxaro is currently investigating various co-generation projects where wasted heat and gas can be used to generate power.

The company plans to build two wind farms, one on the west coast and another inland in South Africa and these projects are expected to produce about 200 MW of power.

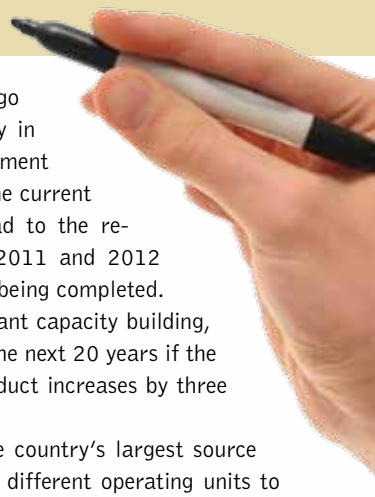
He says the planned generation projects are situated in the Western Cape, Mpumlanga, Limpopo and Gauteng and would generate between 7 MW and 90 MW each. Apparently a number of projects are already in the pre-development stages.

Among other projects, Exxaro is planning to build a wind farm – in a joint venture with European Energy and IFU of Denmark – near Tsitsikamma in the Eastern Cape. It will erect an 80-metre mast in August this year and hopes to reach the feasibility stage for the project by December next year.

It is also planning a 50 MW gas power plant in Botswana – depending on the availability of gas in the area – and is believed to be investigating various opportunities in Zimbabwe as well.

He warned that South Africa must establish what he called a "good policy framework" to attract investments into the local power generation sector but cautioned that it would probably take another few years before such a policy framework was in place.

McRae urges nuclear experts to take the lead



Widely respected electricity guru and former chief executive of Eskom, Dr Ian McRae says that South Africa urgently needs to include nuclear power in its power mix to ensure a sustainable supply of electricity in the medium and longer terms.

South Africa currently produces about 80 percent of its electricity from coal-fired power stations. McRae, speaking at a nuclear forum in May this year said that strong leadership was needed if the country was going to implement an efficient energy plan.

He called on representatives of the nuclear industry and the electricity generation sector to develop and display the country's nuclear capabilities and the benefits of using nuclear power to generate electricity.

He says that South Africa has the leaders and the ability to implement a successful energy plan but these leaders need to "wake up" and move the plans ahead.

McRae points out that 12 years ago South Africa had a White Paper policy in place but nothing has been done to implement it since then. He blames inactivity for the current electricity crisis that will probably lead to the re-introduction of load shedding during 2011 and 2012 while new coal-fired power stations are being completed.

McRae cautions that without significant capacity building, load shedding will remain a reality for the next 20 years if the country's growth in gross domestic product increases by three percent a year or more.

He recommended that Eskom, as the country's largest source of electricity, should be unbundled into different operating units to introduce diversity and competition in the country's power generation sector.

He also believes that Eskom cannot be left to operate as a monopoly and says independent power producers are essential in order to meet the country's electricity needs in the future.

McRae says the introduction of an independent system operator, currently being established by government, will have a key role to play as it will prevent Eskom from being the sole purchaser of electricity and level the playing fields for other independent power producers.

McRae urged the government and other investors not to abandon the Pebble Bed Modular Reactor programmethat has been under development for a number of years. The government has already stated that it will reduce its funding for this project.

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Precarious water supplies for Africa

The African countries of Somalia, Mauritania and Sudan have the most precarious water supplies in the world while Iceland has the best, according to research by a British-based risk consultancy Maplecroft.

The survey is aimed at alerting companies about investment risks in countries around the world. It says that climate change and the rising world population means that stresses on water supplies will be an increasing concern for sectors that range from farming to industry.

The water security risk index of 165 nations found African and Asian countries had the most vulnerable supplies. The index was based on a number of factors including access to drinking water, per capita demand and dependence on rivers that first flow through other nations.

Somalia, where just 30 percent of the population has access to clean drinking water, was the most risky country followed by Mauritania, Sudan, Niger, Iraq, Uzbekistan, Pakistan, Egypt, Turkmenistan and Syria.

Rain-soaked Iceland had the most secure water supplies, slightly better than Norway and New Zealand. According to Anna Moss, lead author of the study, shifts in monsoon rains and the melting of glaciers could disrupt supplies in various different countries and lead to cross-border conflicts.

She warns that construction of hydropower dams or more irrigation from natural rivers could further disrupt supplies. The study says that irrigation accounts for about 70 percent of water consumption throughout the world and industry accounts for about 22 percent.

Million times more methane in the Gulf?

As much as a million times the normal amount of methane found in the ocean have been found in certain regions of the Gulf of Mexcico as a result of the massive oil spill underwater. Scientists say the high levels of methane are sufficient to deplete the oxygen levels and create a dead zone in the ocean.

Oceanographer John Kessler of Texas A&M University has been conducting experiments on the surface and in deep-water areas within an eight-kilometre radius of BP's broken wellhead.

The scientists have been looking for signs that methane gas had depleted the level of oxygen dissolved in the water. Oxygen is needed to sustain marine life. They found that background concentrations of methane were up to a million times higher than normal.

According to Kessler up to 30 percent of the oxygen has been depleted in areas closer to the wellhead. Surprisingly, in some of the locations they measured within the eight-kilometre radius there was no depletion of oxygen levels at all and they are now trying to fathom out why this is.

Oil is spilling into the Gulf of Mexico at about 60 000 barrels a day. Methane, a natural gas associated with oil wells, dissolves in seawater and some scientists believe that by measuring the amount of methane it may be possible to more accurately determine the full extent of the oil spill.

The explosion on a BP oil rig on 20 April led to the biggest environmental and economic disaster along the US Gulf Coast. Initially BP said that several thousand barrels of oil were flowing into Gulf but video footage revealed that as much as a hundred thousand barrels a day could be polluting the region.

Now the Russian President, Dmitry Medvedev has called for a global pollution fund to be created so that major international companies that produce oil can pay dues into this fund that will be used as insurance to guarantee that catastrophic environmental pollution can be cleaned up using money from this fund.

Russia has been watching developments at BP closely as 25 percent of BP's global output comes from the Moscow-based TNK-BP joint venture.

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What is a power cable termination ?

By Rhett Kelly Pr. Eng. - Chief Engineer (Eskom Corporate Services, IARC, Distribution Technology)

Ever since the insulated power cable was developed for the transportation of electrical energy, cable terminations have been required to connect the power cable at each end to various types of equipment.

Cable terminations, as do the associated power cables, vary in many respects but are mostly governed by the type of cable insulation (impregnated paper or solid dielectric), the relevant system voltage (which can be categorised in low-, medium-, high-, and extra high-voltage), the conductor size (current transfer capability), the number or cores (e.g. 1-core, 3-core, and so forth) and the environment in which the cable is installed.

The most basic of cable terminations can be found in households where low-voltage cables are connected to various appliances, plugs, switches or even into the miniature circuit-breakers (MCBs) found in the electrical distribution board (DB).

Here the most fundamental requirement is to ensure electrical separation of the conductors and adequate electrical contact between the conductor and the terminals to allow for the required current transfer.

However, the cable termination becomes a lot more involved as the system voltage increases.

NRS 012, which has recently been dual numbered as SANS 876, defines a cable termination as a device that is fitted to the end of a cable to ensure electrical connection with other parts of the system and to maintain the insulation up to the point of connection.

A power cable termination is required to meet a number of important criteria:

- It must provide electrical stress control;
- It must provide an insulator for tracking and/or erosion protection;
- It must provide a seal for the outside environment.

NRS 053 (soon to be dual numbered as SANS 1053) sets out a number of specific requirements for the design and testing of medium-voltage cable accessories – including indoor and outdoor terminations.

Requirements for accessory ranges include earthing of the cable armour, metallic sheaths and screens, environmental sealing and tail lengths. The use of the popular range-taking mechanical connectors (lugs) with shear-off bolts (also called torque-shear connectors) has also been incorporated – allowing for accessories to be supplied complete with all the necessary equipment required to terminate a cable. The all-important type testing requirements specified in NRS 053 ensure that a cable termination product will adequately meet the relevant criteria described above – thus ensuring that the termination will provide reliable operation over the expected life-time of the cable system.

Over the years, provisions made for cable termination enclosures on terminal equipment have changed – as have the cable and accessory technologies. The older types of MV cable termination enclosures (for use up to 11 kV) were originally designed for unscreened belted type impregnated paper-insulated cables and were required to be filled with a hot-pouring bituminous compound.

The compound displaced air, insulating the cores and providing an environmental seal to keep out moisture and pollution.

With the extensive change over to the use of solid-dielectric (e.g. XLPE) insulated cables,the cable accessory technologies have followed suit. Nowadays, modern dry-type accessories using heat-shrink, cross-linked polymeric or cold-applied elastomeric technologies are used extensively. These technologies are designed for use in air-filled enclosures or outdoors and although intended for screened solid-dielectric cables are also now used extensively on paper-insulated cables.

SANS 10198 Parts 10 and 11 have recently been revised and updated to incorporate the modern dry-type accessory technologies and provide a national code of practice for the practical jointing and terminating of impregnated paper and solid dielectric insulated cables.

It is thus important that cable jointers receive formal training from an accredited provider based on this code of practice. Various cable jointing and terminating unit standards and qualifications have been registered with SAQA (South African Qualifications Authority).

The trends seen in the MV switchgear industry clearly shows the need to ensure the right termination is selected for the type of switchgear used.

The design and quality of the cable termination forms part of the picture as even the most well-designed, type tested and installed termination will not necessarily perform as expected if the provisions made at the equipment into which the cable is terminated are not suitable for the type of termination selected.

Thus the selection of the right type of termination is critical. In addition, the equipment must be designed to provide adequate space to allow for the necessary electrical clearances between phases and creepage distances along insulating surfaces.

It also needs to adequately make provision for the type and number of cables to be terminated. This prevents unwanted flashover, partial discharge (surface corona) activity, tracking or erosion on the outer surface of the insulating material.

NRS 012 was developed to cater specifically for this and defines four types of MV cable terminations .

A type 1 termination is a "bare" termination – where air is the sole insulation medium for the terminal connections.

A type 2 termination is defined as a "shrouded" termination – where additional unscreened local insulation is provided in the

form of a shrinkable boot which is shrunk over itself amalgamating insulating tapes applied around the terminal connections.

A type 3 termination is an "unscreened separable connector" (USC) termination – where additional unscreened local insulation is provided in the form of a pre-moulded push-on unscreened separable (pluggable) connector for the terminal connections.

A type 4 termination is a "screened separable connector" (SSC) termination – where additional fully screened local insulation is provided in the form of a pre-moulded push-on screened separable (pluggable) connector for the terminal connections such as those provided with compact gas-insulated switchgear.

Type 3 and 4 terminations require the use of a standardised bushing having a pre-defined profile in order to create a tight seal (interference fit) between the separable connector and bushing surface. T

his ensures that any unwanted leakage currents which could flow from the live cable lug to earth are essentially minimised or even eliminated.

A type 5 termination is currently being proposed as an additional option in NRS 012 and NRS 053 and is a variation of the type 4 SSC termination. The type 4 termination is commonly referred to as an outer cone SSC, whereas the type 5 termination is referred to as an inner cone SSC. In the type 4 termination, the outer cone SSC fits over the 'male' bushing whereas in the type 5 proposed termination, the inner cone SSC plugs into the 'female' bushing mounted within the terminal equipment.

One of the key electrical functions of a termination is to provide electrical stress control to reduce the electric field stress in areas where high electrical stresses could result in partial discharge activity and consequent material degradation.

The most well known area in a screened cable that requires electrical stress control is at the edge of the cable core (insulation) screen after it has been stripped back in preparation for the termination.

In general there are two ways to provide stress control at the edge of the core screen. Both methods effectively reduce the electric field stress at the edge of the core screen by providing a more uniformly distributed or 'graded' field pattern. The first is the more traditional method and makes use of a "stress cone".

This method is also referred to as "geometric" or "capacitive" stress control and is commonly used in high-voltage terminations as well as in medium voltage screened separable connector terminations.

The second method makes use of a "stress control layer" and is found in most modern dry-type medium voltage terminations (type 1, 2 and 3).

There are two types of stress control layers commonly used, namely the "high-permittivity" stress control layer and the "non-linear resistive" stress control layer. The former uses a stress control layer whose permittivity is much higher than that of the cable insulation and the latter uses a layer made of metal oxide (ZnO, Fe2O3) or silicone carbide (SiC) varistor.

The design of stress control layers have to take into consideration the electric field distribution under both alternating current and direct current conditions as well as under fast transients.

Another key function of a termination is to provide an insulator for tracking and/or erosion protection.

Leakage currents flowing in a conductive pollution layer deposited on the termination over time may lead to tracking and erosion on the insulator material if the termination is in adequately specified, designed and tested.

It is vital that a sufficient creepage path (distance) is specified and provided based on the expected level of pollution and that the termination insulating material is designed to either limit the flow of leakage currents and/or prevent tracking and erosion from occurring.

Tracking is an irreversible degradation by the formation of paths starting and developing on the surface of an insulating material. These paths are conductive even under dry conditions.

Tracking can occur on surfaces in contact with air and also on the surfaces between different insulating materials.

Erosion, on the other hand, is an irreversible and non-conducting degradation of the surface of the insulating material that occurs by loss of material.

Erosion can be uniform, localised or tree-shaped.

Heat-shrink terminations make use of the well known red "anti-track" polymer and primarily rely on a filler compound called aluminium tri-hydrate which is used to prevent tracking. Silicone rubber elastomers used in cold applied terminations, on the other hand, rely primarily on a property called "hydrophibicity" to prevent the formation of a continuous (conductive) moisture film on the insulator surface by causing water beads to form and thus limit the magnitude of leakage current.

The creepage distance on a termination is directly related to the termination (or tail) length and the number of rain sheds provided. The longer the creepage distance, the lower the leakage current. Minimum specific creepage distances are provided in NRS 012 for different pollution levels.

The recently revised national standards NRS 012 (SANS 876), NRS 053 (SANS 1053), SANS 10198 (parts 10 and 11) now work harmoniously in providing users with the necessary requirements not only for power cable terminations, but also the associated cable termination enclosures.

The correct specification and design of cable termination enclosure as well as the cable termination will provide for years of trouble free service.

The SAIEE-UCT Communications and Networking Seminar held at UCT

By Joseph Wamicha and Joyce Mwangama

The seminar was held on May 26 and featured some of the most renowned IEEE lecturers and the most cutting-edge research currently going on in the world. The IEEE Distinguished Lecturers were in Cape Town for the International Conference on Communications (ICC) that was being held at the Cape Town International Convention Center (CTICC). Through the combined efforts of the UCT IEEE Student Branch and the SAIEE, some of the Distinguished Lecturers were invited to UCT to give those who did not have an opportunity to attend the ICC, a chance to gain insight into the lecturers' cutting edge communications research.

The seminar began with opening words by Prof. Barry Downing, head of the elecrical engineering department, who proudly welcomed everyone to the event. The first distinguished lecturer to step onto the podium was Prof. Susana Sargento from The University of Aveiro in Portugal. Prof. Sargento, though still very young, is a very accomplished electrical engineer.

Her lecture outlined the research being carried out to ensure that a user can seamlessly traverse from one network to another, even though they are using different communication protocols, as well as the concept of virtual networks (an abstract network that is in actual fact composed of several heterogeneous but highly optimised network types underneath).

All this is done while ensuring high quality of aervice (QoS) for the user. Services in such networks are able to satisfy consumer needs by being context aware.

The second lecture was a very entertaining one on the importance of electrical engineering Innovation to business was given by Dr. Celia Desmond. She made the audience realise just how quickly technology is changing. Should companies fail to adapt to these rapid technological changes, they soon become obsolete.

For instance, just ten years ago, Alcatel-Lucent was one of the largest telecommunications companies globally. It has since lost significant market share with companies such as Huawei and ZTE earning far more revenue than it does.

Social Networking websites, such as Facebook and Twitter, have gained phenomenally in popularity and it will be interesting to see their effect on the evolution of communications over the coming years.

The third lecture, by Prof. Michael Devetsikiosis from The University of North Carolina, chose as his theme A World stepped out of the future. He talked about open source 3D virtual reality software being used at The North Carolina State University to teach programming to computer science and electrical engineering students.

Students can mould themselves into any virtual character of their choice. This character is then able to enter and live inside the virtual campus world. The 3D virtual world has proved invaluable for collaborative projects, where the team members are located in different corners of the globe. Their work seeks to harness the power of 3D virtual world games such as Second Life, for educational purposes since higher retention rates have been reported for classes given in the 3D virtual world.

A lecture on the business challenges faced in formulating network operator agreements that are necessary to ensure user mobility was then given by Vitor Jesus from The University of Aveiro. This was followed by a lecture from Dr. Azzedine Boukerche from the University of Ottawa who talked about a large-scale distributed simulation and collaborative virtual environment. In this project students focus on applications that require fine-grain monitoring of physical environments subjected to critical conditions such as fire, leaking of toxic gases and explosions.

Joseph Miquel then gave a very interesting lecture on the cutting edge research being undertaken in the field of wireless nano-sensors.

His research group is able to manipulate materials at the molecular level so that they acquire new properties that may be used for making a new generation of extremely powerful nano-sensors and nano-antennas.

The new nano-sensors now have a higher detection range, lower power utilisation, longer lifetimes and can even be used for monitoring biological cells. Nano-actuators are also being developed, where a nanotube is bent whenever an electrical current is passed through it (nano-tweezers). The nano-sensors are powered using ambient energy such as body movement, accousting waves and structural vibrations.

Joseph Miquel's sensor device consisted of a location finding system, a sensor ADC, a processor, a transceiver, a mobiliser and a nano-antenna. The nano-antenna mostly operates in the terrahertz frequency range.

The seminar was capped off with a lecture by the very experienced and highly renowned Prof. V.K. Bhargava of the University of Victoria who gave a lecture on the multi-gigabit wireless multimedia networks, which is the future of communications.

He kept the audience enthralled with his great sense of humour and wonderful insight into the future of wireless networks. The hardware for this networks is designed mostly using CMOS chips and will involve using 60GHz mm wave frequency band for communications.

This promises a vast amount of unlicensed bandwidth that can be used for multimedia wireless network applications. CMOS designs help to reduce the cost of the communications equipment being used. Usage models for the 60 GHz WLAN (Wireless Local Area Network) and WPAN (Wireless Personal Area Network) Gigabit WLAN and Wireless HDMI (High Definition Multimedia Interface).

Since the antennas at 60GHz are much smaller than antennas operating at the microwave range, far more antennas will be able to fit into a given phase antenna array, hence allowing for better antenna beamforming and directivity.

The seminar was well attended by students and staff from the university, as well as guests from industry. Some key members of the audience include the SAIEE President Dr Angus Hay, as well as the IEEE Women in Engineering International Programme Director Keyana Tennant.

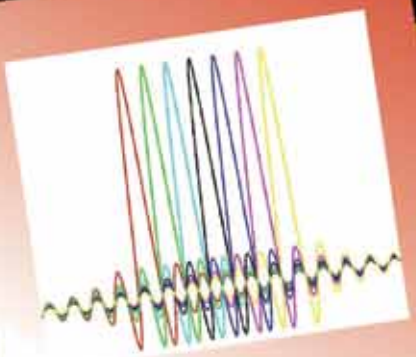
All the attendees thoroughly enjoyed the seminar as it is not often that such esteemed speakers give high level lectures all in the same afternoon.

TELECOMMUNICATIONS RESEARCH GROUP

POWER LINE COMMUNICATIONS:
University of Johannesburg

Our Research Interests

Powerline Communications
Digital Communications
Coding Techniques
Information Theory
Video Communications
Networks



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