WATnow

Be Enlightened

SA prepared for World Cup but under-currents are swirling

Biofuel emissions are four times higher than diesel

Elephants are really scared of bees

Concentrated solar power – the small heliostat solution

Official Magazine of

SAIEE

May 2010

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

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It's engineers that made it happen

Here we sit in anticipation that 300 000 soccer fans will troop through our world-class airports into our world-class stadiums to watch a world-class event that lasts for little more than a month. I wonder whether we will provide the world-class hospitality to go with it? We usually do.

For years now there have been those sceptics who has settled back and confidently predicted that South Africa would never be able to host an event of this magnitude.

These doomsday predictors repeatedly kept saying that Germany was on standby, that Australia had been warned that it will have to step into the breach and even Greece was cited as a potential host nation by these people-of-little-faith.

I wonder what they have to say now?

It's like politics: ask anyone if they ever supported apartheid or voted for the Nationalist government prior to 1994 and they'll all tell you: "Of course not. I've never been a racist. . ." and yet the Nationalist remained in power for more than 40 years so someone must have been voting for them.

I am delighted, and proud, of the strides that the South African engineering community has made in bringing this magnificent event into the realms of reality. For without the engineers, the hard-working builders, the technicians, technologists and, perhaps most importantly, the artisans, then maybe Australia or Germany might have been called in off the bench.

I think that the stadiums, the roads, the infrastructure and even the precinct improvements around each stadium are all a tribute to the engineering capability that South Africa has.

The tragedy is that there are just so few engineers and, as a precious resource, we still keep losing our engineering skills to other countries.

Certainly, the massive infrastructure development programmes, coupled with the intensive pace of construction work needed to make the FIFA Soccer World Cup 2010 a reality boosted profitability of the construction companies and all the other satellites that feed off it.

And I'm just as certain that the level of construction work will start to tail-off in the immediate future. But what is reassuring is that the government's own infrastructure-spending programme remains buoyant and, given the hundreds of thousands of people coming to this country, we might even see investment levels rise.

As I write this I'm certain that Eskom will be able to deliver the energy that we require over the next few months. I'm just as certain that in 2011 and probably 2012 we will see rolling black-outs returning to the country unless we can put all the other generators in, to work on keeping the grid fully charged.

This might seem like wishful thinking but given the back-up power capacity that have been installed in South Africa it seems relatively simple for these reserve power resources to be added to the national grid at a price that's covers at least the running costs of the generators themselves.

Liberty Properties, to name just one development company, has spent more than R500-million on buying and installing back-up power generators and these will remain idle for most of the time when power supplies are stable.

Now if Eskom were to be proactive, then it would immediately get onto companies such as Liberty (and many others that have the backup capacity) and reach a deal with them to use the power that they are capable of providing to shore up the national grid with a little bit of extra power.

After all, every little bit of electricity helps when you are about to switch the lights off in Sandton, Germiston or Bedfordview. A similar situation prevails at the mines, at other major industrial concerns and, of course, at most of the privately owned hospitals and clinics.

Yet again, I think that the South African engineers must be invited to come up with some elegant solutions to the inevitable shortage of power that will occur over the next two years.

And I have no doubt that, if tasked to do so they will find an elegant solution.

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WATTnow

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WATT'S



WATT'S HAPPENING

5> WATT'S GOING ON?

Biotechnology to expand use of biomass in China; Workplace injuries drop at Goodyear factory; Review of the First Ten Decades; Heat shield used on (almost retired) Space Shuttle rockets; Aerial surveys improve line management and maintenance; Springboarding the professionals of the future; Storm 2 – Now here's a phone that's really worth having.






49> SAIEE

Engineering the future – Dr Angus Hays, the President of the SAIEE delivers his Presidential Address at the SAIEE annual general meeting held at Neotel in Midrand; SAIEE workshop on load shedding; With sadness people pay tribute to Ron Wedderburn and Clive Burchell.

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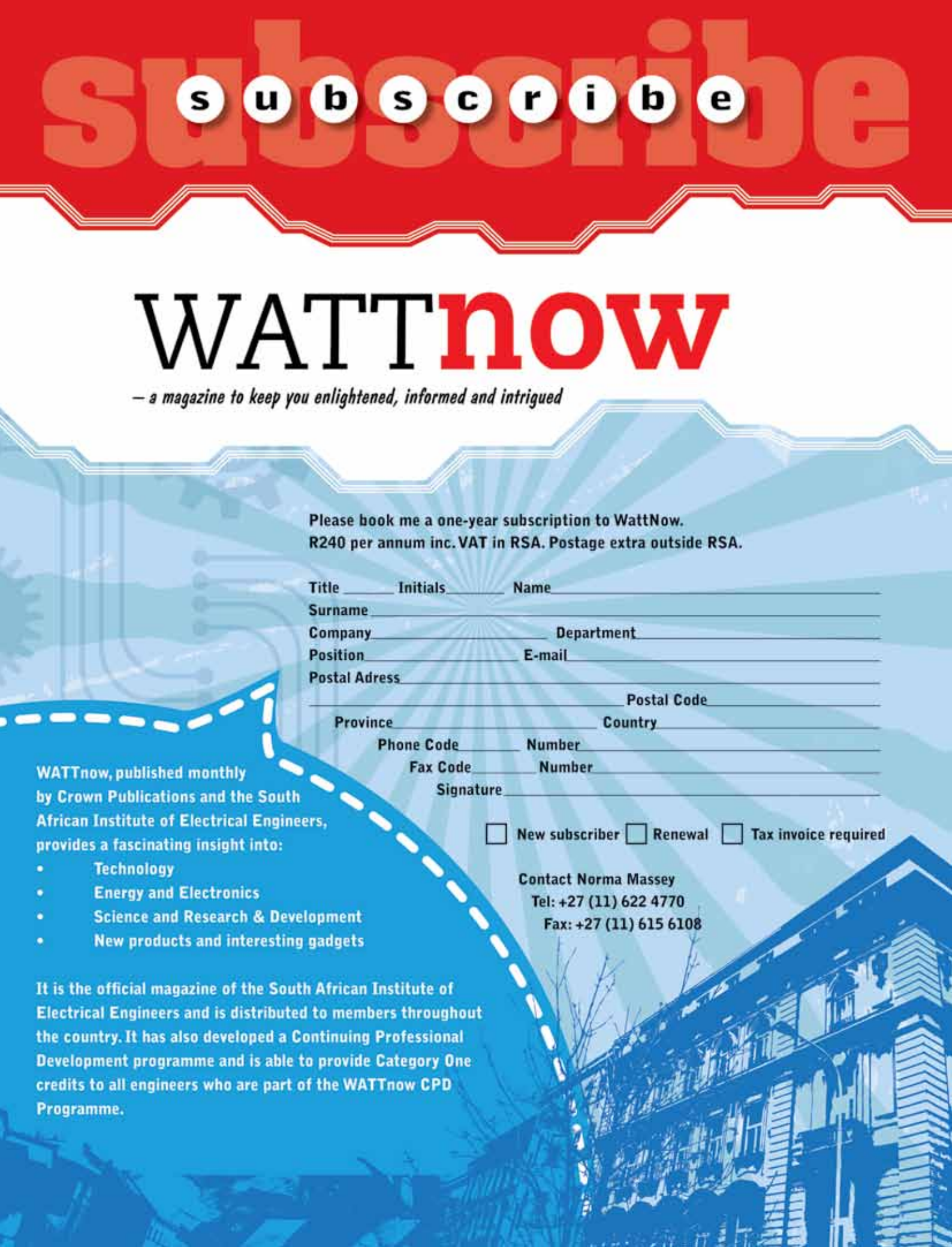
WATTnow, published monthly by Crown Publications and the South African Institute of Electrical Engineers, provides a fascinating insight into:

- Technology
- Energy and Electronics
- Science and Research & Development
- New products and interesting gadgets

It is the official magazine of the South African Institute of Electrical Engineers and is distributed to members throughout the country. It has also developed a Continuing Professional Development programme and is able to provide Category One credits to all engineers who are part of the WATTnow CPD Programme.



Biotechnology to expand use of biomass in China

Novozymes, a global bio-innovation company based in Denmark, and Dacheng Group, a major starch processing company based in China, are co-operating to make plastics from agricultural waste. The two companies have agreed to develop bio-chemicals derived from biomass and to promote the industrialisation of plant-based glycol.

Glycols are biochemicals used in household cleaning products, cosmetics, and as building blocks for making polyesters and plastics.

"This collaboration with Dacheng Group is another important step toward the future bio-based society," said Steen Riisgaard, CEO and President of Novozymes. "Biotechnology will open the pathway to a biobased society in which renewable agricultural residues can be converted into biochemicals and nearly substitute the role that petrochemical industries have been playing since the industrial revolution."

This agreement is one in a range of similar partnerships between Novozymes and major companies such as Braskem in Brazil and Cargill in the United States to develop new technologies to derive biochemicals that can replace traditional petrochemcials that are used in a wide range of products.

In terms of the agreement, Novozymes will provide Dacheng Group with knowledge and the enzymes for converting biomass like corn stover, wheat and rice straw into sugar. Dacheng Group will then convert the sugar into glycol at its commercial facility in north-eastern China.

China currently produces 700 million tons of agricultural waste per year, including: corn and wheat stovers; rice straws; and others. Much of this waste is burned directly in farm fields, which can cause serious air pollution, rather than using this waste to develop new technologies and new sources of clean energy. Moreover, the development of plant-based glycols could generate new income sources for China's farmers and lessen China's dependence on imported crude oil.

Workplace injuries drop at Goodyear factory

In line with Goodyear's global No one gets hurt campaign, the South African plant has implemented safety strategies that were so successful that workplace injury statistics dropped by 50 percent last year according to the company's risk control manager, Rene van der Merwe.

Goodyear's Uitenhage plant was also the only plant in the company's Europe Middle East Africa (EMEA) region to record zero 'lost time' injuries. The safety plan focuses on ergonomics, a behaviour-based programme called Target Zero, Job Safety Analysis and Risk Assessment and an Absolute Safety policy.

"Target Zero encompasses observing employees' safe or unsafe acts. Where accidents have occurred, a senior-management safety team analyses behaviours and suggests safer actions - for example, using different tools or changing cutting methods. Next, a trained team of employee volunteers monitor safe and unsafe actions during a designated 15-minute time period each day. From these observations we calculated the percentage of people acting safely," she explains, "and were able to introduce 10 safe actions and successfully modify five unsafe acts."

All 132 factory jobs were assessed last year in terms of ergonomics. Health and safety specialist, Stoffel Williams, says he and his four Ergo teams had "analysed each job for ergonomic risk and introduced corrective action if the risk was found to be medium or high."

Two of Goodyear's ergonomic successes were placed among the 14 finalists in Goodyear Global's Human Tech Ergonomics Competition 2009.

Goodyear's Job Safety Analysis and Risk Assessment saw specialised teams carefully monitoring and developing a full risk assessment for each stage of an employee's job, while its Absolute Safety policy identified seven critically unsafe actions which, if carried out by an employee, would result in a written warning or even dismissal.

To reinforce these safety initiatives, several other campaigns were run last year. One, to raise ergonomics awareness, asked employees for ideas to improve their own work stations and the best of these were implemented. A Hand Safety campaign saw hand injuries drop by 60 percent, while the successful Yes, you can be injury free campaign, where employees identified risks and hazards at their own machines, resulted in only two minor injuries being reported in December.

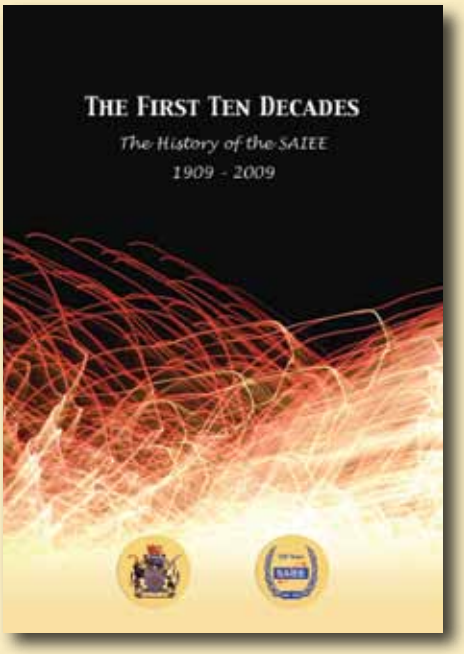
Goodyear's latest safety campaign Kenako – it's time to score a safety goal, in which employees must identify hazards at machines in other areas, saw injuries drop by 70 percent in January.

"It's a zero tolerance philosophy, applied from management down, that has had a significant impact on our safety statistics," Van der Merwe said.

{How unsafe must Goodyear's factory have been prior to the implementation of these campaigns? – Editor}

The First Ten Decades:
The History of the SAIEE 1909-2009

Reviewed by Professor Duncan Baker



For the past several weeks I have been dipping intermittently into this commemorative centennial coffee table book about the South African Institute of Electrical Engineers (SAIEE).

But why dipping?

Because this is not your regular coffee table book to be devoured at a single sitting while you digest some of its spectacular photographs and its equally compelling by-lines. On the contrary, it is a book to be savoured in those few moments when we need to relax and ponder things for a while.

This is a careful compilation of the many events that have shaped not only the SAIEE over the last hundred years or so, but also in no small measure it reflects the growth of the South African electrical and electronics industry, and more recently the developments in information and computer technology.

The compiler is Mike Crouch and he, along with the SAIEE itself and the many sponsors are to be congratulated on an excellent production. I have no hesitation in recommending that it should feature in the reception area of any company involved in the electrical and/or electronics industry in South Africa.

The introduction briefly sets the scene with regard to the establishment of electrical engineering activity in South Africa, mainly in the old Transvaal area due to the impact of mining. The South African Society of Electrical Engineers was formed prior to the South African War of 1899-1902. The society did not survive the War, but in 1909 seven of the old SASEE's members became founder members of the SAIEE. What follows in the rest of the book is a careful compilation of the many important lectures and events that shaped the SAIEE, its members and their ability to contribute to their profession.

What stood out for me in the First Decade was the advice given to Young Professionals by JH Rider in his President's valedictory address in January of 1913. Among other things he said: "Take every opportunity to improve your knowledge and experience; accommodate yourself to the circumstances in which you find yourself placed; ..." Sound advice and with the advent of continuing professional development as a legal requirement for continued professional registration, as true now as it was then!

A casual paging through the book often results in finding items both quirky and interesting. So, for example, one finds in the First Decade, a photo and description of Prof Bergonies Chair – an early device for shock therapy for obesity and heart trouble. Today's versions are widely touted in the media and are probably less lethal! Also, did you know that Pretoria was the first city in the Transvaal to be lit by electricity?

It is, quite frankly, extremely difficult to do full justice to this monumental work.

The Annexures contain listings of the Presidents of the SAIEE, the various Presidential Addresses to members, the prestigious Bernard Price Lectures, President's Invitation Lectures, Honorary Vice-Presidents, Honorary Members and Honorary Fellows, and a listing of various Awards and their recipients. Other useful information relates to the role of the SAIEE in the engineering profession in South Africa.

These annexures are in turn followed by interesting historical profiles of the various universities and companies who donated so generously and made this excellent book possible.

On a personal note, while browsing through somewhere around the Sixth Decade in the book I realised with something of a shock that I have been associated either directly or indirectly with the SAIEE for nearly fifty years.

My first contact was when I was sent to the then National Institute for Telecommunications Research of the Council for Scientific and Industrial Research to rebuild a Cossor ionosonde (a vertical sounding HF radar) in 1961. I was to establish an ionospheric research station at Sanae in Antarctica with the Third South African National Antarctic Expedition in 1962.

I vividly recall the discussions by many of the staff of the latest developments in electrical and electronics engineering after they had attended one or other SAIEE lectures at Kelvin House. For my period there I really sat at the feet of the masters, Dr Frank Hewitt, Messrs Trevor Wadley (later Dr), Raymond Vice, Dick Holscher and Tess Peter to name but a few. All of them gave generously of their time and experience and in many ways shaped my future career.

As for my copy of the book?

I intend to donate it to the history section of the Institute of Electrical and Electronics Engineering. The SAIEE has a Memorandum of Understanding with the IEEE and no doubt this book will be a useful source of reference for our colleagues in other parts of the world.

Heat shield material used on the (almost retired) Space Shuttle rockets

There is probably no better seal of approval than being a supplier to the United Space Alliance, the prime contractor for National Aeronautics and Space Administration's Space Shuttle programme. The Shuttle's two solid rocket booster tanks are sprayed with an ablative heat shield, which is partially made of Trelleborg Eccospheres.

Seventy-seven seconds after the Space Shuttle launches from the Kennedy Space Centre in Florida, its two solid rocket booster tanks disconnect and fall back into the Atlantic Ocean.

In order to keep the tanks from burning up in the atmosphere, they are sprayed with an ablative heat shield, a covering designed to accept the heat and burn-off associated with high-speed travel through the earth's atmosphere. This shield, which is partially made of Trelleborg Eccospheres, resins and other fillers, vaporises on its way through the atmosphere, taking the heat with it and leaving the tanks intact.

"Eccospheres work in the same way as the insulation in your attic," says Gary Gladysz, vice president technology at Trelleborg in Massachusetts. "In both cases, trapped air pockets are what gives them their value as insulation materials. And our hollow glass microspheres on the solid rocket booster tanks on the Space Shuttle keep the heat away from the critical structure underneath."

Recently, United Space Alliance and NASA paid special tribute to the Trelleborg team involved in developing the Eccospheres used on the Space Shuttle solid rocket booster tanks.

"We were recognised for our quality product, on-time delivery and for all of our hard work in fine tuning the Eccosphere material to the United Space Alliance and NASA's increasingly stringent specifications," says Gladysz. The Trelleborg team worked on optimising the particle size and distribution of the Eccosphere glass material as it is sprayed onto the tanks at the United Space Alliance facility in Louisiana.

"We have moved the properties of the microballoons to a portion of the specification that will make the material easier to process for the United Space Alliance," says Gladysz.

The United Space Alliance has its headquarters in Houston, and it was jointly owned by Boeing and Lockheed Martin. As one of the world's leading space operations companies, the United Space Alliance is NASA's primary industry partner in human space operations.

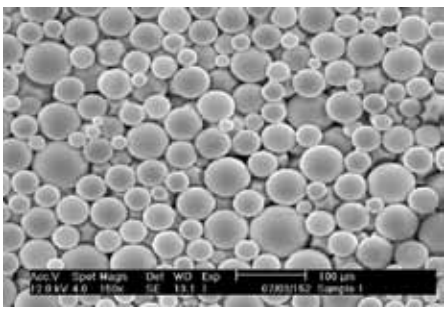
The Eccospheres are Trelleborg's branded range of hollow glass microspheres and were first exploited and are still used for buoyancy in deep-sea submersibles and oil-drilling equipment. Today five different series of Eccospheres, each with specific chemical and physical properties, are manufactured by Trelleborg Offshore, a unit within Trelleborg Engineered Systems, at its facility south of Boston.

They are used throughout the aerospace industry to manufacture strong, lightweight structures such as fuselages, bulkheads and floors, and in turbine blades, among many other applications.

Hollow microspheres, also known as microballoons, are also used to create syntactic foams. These are composite materials synthesised by filling a metal, polymer or ceramic with microspheres. The presence of hollow particles results in lower density, a higher strength-to-weight ratio, a lower thermal expansion coefficient and, in some cases, radar or sonar transparency for military applications.

The IG 201 range of Eccospheres used on the solid rocket booster tanks on the Space Shuttle were specifically engineered according to the United Space Alliance and NASA's specifications. They have the diameter of a human hair. Because they are spheres with a smooth surface, when in a pile, Eccospheres behave like a liquid. The technology to manufacture such hollow glass spheres dates back to the 1950s and an early aerospace application was when the microspheres were used on the Viking Lander that landed on Mars in 1976.

Due to their exclusive glass chemistry and method of manufacture, Eccospheres' glass microspheres exhibit a number of different properties that can be fine-tuned for different applications. These include high temperature resistance up to 800°C, good density-to-strength ratios, clean surface chemistry and low thermal conductivity.



Eccospheres glass microspheres are hollow thin-walled glass microspheres composed of sodium borosilicate glass.

Pyrofend™ can withstand temperatures up to 1,600°C.

Able to withstand blasts from 60lb of high explosives at 20ft, Trelleborg's syntactic foam is already used in US nuclear submarines.

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Aerial surveys improve line management and maintenance

The accelerating global awareness for alternative energy may create short term opportunities for the installation of systems and solutions in industrial and residential communities in First World countries claims Peter Moir, chief executive of Southern Mapping Company (SMC).

He says these systems remain cost prohibitive in fast growing developing communities in Africa, rendering alternative energy sources a substitute for traditional forms of power distribution. "The power distribution industry plays a major part in employment in these communities, from manufacturing and installation to aerial surveying of sites," he says.

"Using conventional surveying methods to assess hundreds of kilometres of overhead power lines can take years whereas aerial surveying saves time, money and resources," he says.

The company has apparently completed several power line surveys in Africa, using Lidar to derive a digital terrain model and digital ortho-photos to obtain a map of the specific areas.

"The processed data has been handed over to our clients and can now be used to evaluate their current power line infrastructure and this helps them to effectively manage current and planned infrastructure. This information proves vital in assessing environmental hazards adjacent to power lines," he adds.

A key goal of the overhead power line design process is to ensure that an adequate clearance between conductors and the ground is maintained, in order to prevent dangerous contact with the line.

Initial design also requires prior consideration of the conductor temperature, which can increase due to escalating heat from electrical currents flowing through it, forming more slack in the lines between the towers. Consequently the minimum overhead clearance should be maintained for safety and requires proper consideration and planning beforehand.

Tower structure foundations can be large and costly, particularly if the ground conditions are poor, such as those in wetlands. Structures can be stabilised considerably with the use of guy wires to counteract some of the forces applied by the conductors, but adds to overall costing.

"Accurate research done on building locations of towers can reduce costs considerably," says Moir. He adds that proper project management is only possible when accurate survey data is on hand.

Power lines close to the N3 in Kwazulu Natal.

Springboarding the professionals of the future

A decade ago, access to technology was limited. Along with expanded access has come a growing pervasiveness of technology in society, and for a generation of young people, technology has assumed a substantial stake in their social and educational lives.

Some argue that today's students, surrounded by digital technology since infancy, are fundamentally different from previous generations and are no longer the people our educational system was designed to teach.

Bishops (Diocesan College) in the Western Cape understands that ICT literacy is vital to the professionals of the future, and is using its technology rich classrooms as a springboard to ensure that the promise that technology holds for student achievement is realised. "Various technologies deliver different kinds of content and serve different purposes in the classroom," explains Sally Bowes, IT Director at Bishops. "Careful planning for technology use is essential because technology is expensive, but everything from video content and digital moviemaking to laptop computing and handheld technologies can be used in classrooms, and new uses of technology are constantly emerging."

She explains that students can learn "from" computers—where technology is used to provide tutorial type assistance serving to increase students' basic skills and knowledge; and students can learn "with" computers—where technology is used a tool that can be applied to a variety of goals in the learning process, serving as a resource to help develop higher order thinking, creativity and research skills.

This is one of the reasons that Bishops implemented, and upgraded, video and audio editing software from Sony Creative Software. In partnership with Phoenix Software, Bishops recently upgraded its existing Sony Acid Music Studio and Vegas Pro packages in order to benefit from the enhancements and additional features offered by the newer versions. Vegas Pro 9 integrates two powerful applications that work seamlessly together to provide an efficient and intuitive environment for video and broadcast content creation and production. With broad format support, superior effects processing, unparalleled audio support, and a full complement of editorial tools, the Vegas Pro 9 interface provides a fully customisable workspace for accomplishing a wide range of production requirements.

Acid Music Studio software is the perfect tool for original song creation, multitrack audio and MIDI recording, studio-quality mixing, and effects processing. The software makes live recording easy, and provides numerous tools such as 3 000 Acidised music loops, 1 000 MIDI files, and built-in effects. "Students must have a range of skills to express themselves not only through paper and pencil, but also audio, video, animation, design software as well as a host of new environments such as e-mail, Web sites, message boards, blogs, streaming media, etc.," says Simon Campbell-Young, CEO of Phoenix Software. "Using software such as this will positively impact on student achievement, easily justifying the investment."

Storm 2

– Now here's a phone that's really worth having

Sometimes the things that manufacturers do are completely beyond comprehension. Some time ago, readers may remember that I published a rather scathing review of the BlackBerry Storm mobile phone that was launched, amid a great fanfare, more than a year ago. The phone was roundly condemned by almost everyone who had the misfortune of using it.

Then, more recently, Research in Motion released the Storm 2. What an absolutely sensational change. So why did they bother with the original Storm? If they'd released the Storm 2 instead – admittedly it might have taken longer to get it to market – they would have had millions of really satisfied users all around the world.

So the decision to release the original Storm remains one of the incomprehensible mysteries that only someone in the marketing department (filled with jargon and addled thinking) could explain.

And, all the while, they had a really wonderful little device sitting in the wings, just waiting to take its rightful place in the product line-up that has captured a huge share of the smartphone market for BlackBerry.

Let me tell you in a nutshell what the Storm 2 has achieved:

- It works. It's effortless to use, you can type your sms messages or your e-mails with a high degree of accuracy and that irritating buzz from the keyboard as you type has been replaced with a much softer, easier to detect vibration that is reassuring if nothing else.
- The word substitution function works really well and makes typing longer notes so easy and frankly very quick too.
- You can use the Qwerty virtual keyboard with your two thumbs (like most conventional cell phone users do) and the accuracy is exponentially higher than the previous attempt made by BlackBerry when it launched the original Storm.
- The graphics on the Storm 2 are exceptional (I suppose they were also very good on the Storm too) and the ease of use makes it that much quicker to navigate through the different applications and menus. Similarly, the media functionality is really a nice-to-have function if you use your mobile phone to play back music (something I generally don't do).
- There are a whole host of downloadable applications that bring different functionality to the Storm 2 and this time the applications can actually be used because the keyboard accuracy and the touchscreen functionality has improved so much.

So you tell me why on Earth Research in Motion released the original Storm.

RIM admits that it has significantly improved the touchscreen platform with new technology that works. That's the beauty of it. It works. And it's also easy to connect your phone, stay connected and send Facebook messages and Tweets with surprising speed and accuracy. Yes it does have the SurePress technology but again, RIM has improved it so significantly that it works too and is a pleasure to have on the keyboard and on the phone's applications as well.

The Storm 2 is much slimmer and lighter than it's predecessor and it is really sleek to look at with sloped edges, chrome accents and a stainless steel back that is easy to remove. The large 3,25 inch (76 mm) screen is bright and the colours sensational with a resolution of 360 x 480 at 184 pixels per inch. The capacitive touchscreen has integrated functions such as Send, End, Menu or Escape) and these buttons work – unlike the original Storm.

It offers global connectivity support with UMTS/HSPA quad-band EDGE/GPRS/GSM and Wi-Fi. The 3,2 megapixel camera comes with a variable zoom, built-in flash and video recording capabilities and it's easy to upload any images to the social networking sites that are gaining in popularity all the time.

It also comes with 256 MB of Flash memory so it is really quick to save large files or to start-up or shut-down the phone. The Storm 2 has 2 GB of onboard memory storage and a microSD/SDHD memory card slot just in case the onboard memory is not sufficient. It supports both the 16 GB and the 32 GB cards.

The phone itself has noise suppression technology, gives you crystal clear voice signals and the face detection proximity sensor prevents accidental clicks and blanks the screen when the user is on the phone.

The media player supports video, pictures and music and the synchronisation of data is really easy and simple. In fact I set it up to run on my Mac and on my Windows Vista machine and it did so completely seamlessly and easily.

The operating system on the Storm 2 is BlackBerry's new OS 5 and this makes the phone more responsive while the usability enhancements are really a treat because inertial scrolling now works, spin boxes allow things like dates and times to be easily set and changed and the OS even has gradient shading on buttons and greater use of animation. These features have little value really, but they do look really pretty.

The BlackBerry Browser is also a pleasure to use and of course with the enhanced graphics from the screen it makes reading newspapers or other online sources a pleasure. I would even be tempted to read an E-book on the phone because the display is so crystal clear and so easy on the eyes.

Would I buy one? Absolutely. And I would do so without fear or favour because, while I have used a range of BlackBerry phones, this is the first one that would get me to migrate away from the fixed Qwerty keyboard with buttons to the virtual keyboard that is integrated into the touch screen,

There is only one thing that irritates me about the Storm 2 (and the iPhone for that matter) and that is the touchscreen technology invariably means that your screen is messy and always smudged with fingerprints. Even though I wipe the screen with a soft cloth, two or three times a day, it still smudges because there is a natural oil in the skin that stays behind on the screen.

But that's one of the most insignificant objections I've ever lodged about a phone and frankly one that's not worth considering. Tou chscreen phones have messy screens. That's the nature of the technology.

Apart from that, it's a really great phone and one that I certainly have enjoyed – as much or perhaps even more so than the iPhone that I used for a while too. And BlackBerry's connectivity and ease of use certainly endorses it as one of the top smartphones in the world.

Pity about the original Storm – but really, hat's off to RIM with the Storm 2. I just wish they'd never released the Storm and gone straight to the Storm 2 instead.

Visor Mount and Garmaps – then you're set to go

For all those thousands of BlackBerry users around South Africa, there is one piece of essential additional kit that you must get: it's known as the Visor Mount Speakerphone and it is an absolute pleasure to use.

Apart from providing crystal clear sound when you are making or receiving phone calls, you can use it to playback your music through the car's radio system. It supports voice-activated dialling, caller identification and verbal notifications to let you know who is calling you while you're driving.

The wireless transmission is handled via the built-in Bluetooth connections and the Visor Mount itself is slim, extremely light and provides up to 13 hours of talk time. It also uses noise reduction technology and echo cancellation and this means that the quality of the calls is better than the existing Nokia car kit that I have in my vehicle anyway.

The Visor Mount works seamlessly with mapping applications and I chose to exchange the built-in Vodafone SatNav application for the much better, more sophisticated and more precise Garmap for Mobile application.

Now, Dorah the Explorer talks to me via the Visor Mount, giving me her precise instructions clearly and never getting irritated when I know a back route that's slightly quicker than the one she's chosen.

Dorah the Explorer will suggest that I make a U-turn a couple of times (without a hint of aggravation in her voice) before quickly recalculating my route and synchronising with me. (I love the Garmap for Mobile application, I just wish, sometimes, that Dorah the Explorer would freak out at me using a choice range of expletives and truly express her frustrations).

But Dorah's much too polite for that.

So with the combination of Garmap for Mobiles, the Visor Mount speakerphone and my BlackBerry Storm 2, I now can't wait to take myself exploring to foreign states such as Tanzania (for a bit of Sunday hunting), Mozambique to catch a yellow fin tuna, Luderitz for some lovely fresh oysters or Botswana to find my own peaceful spot where I can while away a day.

Dreaming's nonsense isn't it. But having the tools to let you dream between Johannesburg and Pretoria on those dreary peak hour highways. Do yourselves a favour – spend the money to buy the tools. Then enjoy them as much as I do.

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Telkom to Neotel or Neotel to Telkom – any way you choose

People who have a fixed line at the office or at home can now switch from one network to another without having to change the existing number. This applies equally to people who use Telkom's service, Neotel's service or any other similar services.

At the end of April, Geographic Number Portability (GNP) became a reality for home users – although it had been possible for business users to keep numbers while changing service providers for several months before that.

According to Neotel's chief executive, Ajay Pandey, GNP represents a significant event in the regulation of the South African telecommunications industry because it means that subscribers now have choices when it comes to buying fixed line services in South Africa.

Until recently, Telkom had a monopoly on fixed line services and a stumbling block for many users was the fact that if they wanted to switch to Neotel (the new kid on the block in terms of fixed line services) they were forced to change their number.

For many thousands of fixed line users, the hassle of changing telephone numbers just to get another service was not worth the potential savings that they might be able to achieve from Neotel.

However, as Pandey points out, the real value is choice and this applies to a cross-section of services available from the different service providers. The GNP process has been phased in over several months because the technology had to be tested and various legal systems had to be agreed between Telkom and Neotel.

Both companies are now part of the Number Portability Company that was set up in 2005 when number portability for mobile phones was first introduced.

Pandey says that the benefits of GNP are – over and above the obvious one of keeping an established number – that significant savings can be made on website modifications and there is no need to modify any existing marketing documents within the corporate environment because the numbers remain the same. It's just the service provider that changes. The full range of geographic numbers can now be ported from all exchanges around the country. However, the 0800, 0860 and 0861 cannot be ported between service providers.

According to Pandey, the savings that can typically be achieved from using the Neotel network are between 14 percent and 27 percent. Importantly, mobile phone numbers cannot migrate to fixed line and vice versa.

Moreover, value added services such as hunting lines, call waiting, conference calling, call forwarding and voice mail service cannot be ported between the different service providers.

Pandey warns that subscribers are responsible for notifying their existing fixed line service provider that they wish to port their number and must ensure that the provider understands that the line is not being terminated but ported to another service provider.

Subscribers will have to pay the costs rendered by the existing service provider before moving to the new service and incurring new costs under that agreement. A number will not be ported unless the user's account has been paid in full.

"From Neotel's point of view, choice is not just a nice thing to have, it's an economic necessity and could see South Africa sliding backwards into the backwaters of commercial competitiveness," says Pandey.

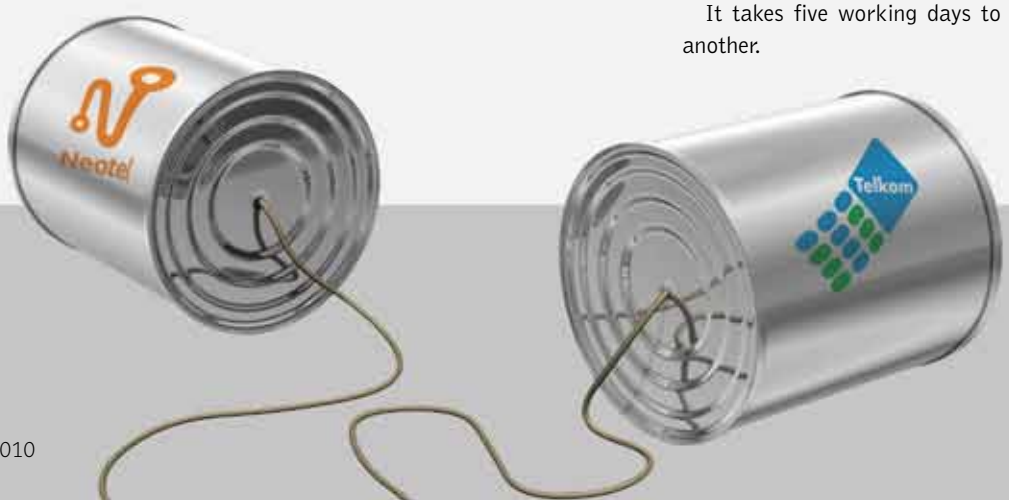
"South African businesses need easy, affordable access to high speed, reliable converged communication services in order to remain competitive in the international market and home users need to be able to remain in touch with families and friends through voice and high speed Internet services too," he says.

He points out that when Neotel was launched four years ago, it entered a market dominated by Telkom and most customers had already established long standing patters of communicating via telephone on an existing number.

"For most organisations and the majority of consumers, having an alternative service provider was wonderful as a concept but impractical if it meant having to change fixed line numbers. This is now no longer necessary," he adds.

In a separate development, Nashua Mobile's managing director, Chris Scoble says that his company will now assist any Telkom customers who want to switch to Neotel to do so immediately. He says that Neotel has a highly competitive offering for home and business users.

It takes five working days to move from one service provider to another.



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100 cyber attacks a second last year

Hackers are unleashing about 100 cyber attacks a second on the world's computers according to a survey carried out by Symantec late last year. It says that while most of the attacks cause no trouble, the reality is that an attack every 4,5 seconds can affect the performance of a computer.

According to the Symantec report, malicious attacks against computers increased by 71 percent between the end of 2008 and the end of 2009. It also says that 51 percent of all viruses, trojans and other malicious programs were logged in 2009 and the company identified almost three million items containing malicious code last year.

It says the steep rise in malicious software was driven by the growing popularity of easy-to-use toolkits that novice cyber criminals are downloading from the Internet and then modifying for their own purposes.

According to Symantec's technology manager, Tony Osborn, some of these kits are free but many others are actually expensive. Referring to a particular package called Zeus – which costs $700 – he says that these packages can be extremely dangerous in the hands of a skilled cyber criminal.

He says that Zeus uses spam to lure people to websites where they can be tricked into installing malicious codes or, depending on the operating system and security, where the software will sneak into the computer through a known vulnerability.

Once it has infiltrated the computer, hackers can set up botnets (that hijack home computers) that are then used to send out spam or plundered for personal data that may exist on the device.

He warned that Brazil and India are now becoming hot spots for cyber crimes and advised all computer users to ensure that they had quality software to prevent viruses and spyware, set up a firewall, applied all operating system updates as soon as they become available and be extremely suspicious about any unsolicited e-mail.

X-37B reusable spaceship tested by US Military

An unmanned Atlas rocket that was carrying a miniature space shuttle has carried out the first successful tests of the X-37B reusable spaceship. The 20-storey Atlas rocket was built by the United Launch Alliance, a joint venture between Lockheed Martin and Boeing.

The Air Force Space Command, based at Colorado Springs, was responsible for overseeing the test flight of the X-37B, which will not be used to carry people but will lug freight into space. While it is similar in shape to the existing Space Shuttle vehicles, it is just over eight metres long with a wingspan of 4,5 m compared with the Space Shuttle that is 37 m long with a wing span of 24 m.

The United States military plans to use the vehicle to test new equipment, sensors and materials in space so that these can be incorporated into satellites and other operational systems at a later stage.

The X-37B is designed to spend up to nine months in orbit and then can return to Earth and land itself autonomously on a runway. It was built by Boeing's advance research laboratory, Phantom Works. A second vehicle is due to be tested sometime next year.

Full details of the X-37B have not been published because these have been classified as secret by the military. The turnaround time between flights is significantly shorter than the Space Shuttle because the X-37B does not carry passengers and has a relatively small payload.

Tolls will be used to repay debt and for maintenance

The South African National Roads Agency Limited (Sanral) says that the tolls collected from the 185 kilometres of highways that make up the Gauteng Freeway Improvement Plan will be used to repay the debt that has been incurred during the upgrading programme and to maintain and operate the roads in the years ahead.

The tolls, estimated at 50 cents a kilometre, but likely to rise by the time the fees come into operation in April next year, will push up the costs of using the road network astronomically for thousands of commuters who need to get to Johannesburg and the Witwatersrand region from other parts of the province.

For people travelling from Krugersdorp or Roodepoort on the West Rand to, say, Benoni or Boksburg on the East Rand, the fees will make a huge difference in the monthly motoring costs. The same thing applies to commuters driving from Pretoria to Alberton.

For people who want to go from one city centre to another there certainly is the Gautrain option but Gautrain does not extend to districts like Boksburg, Brakpan or Benoni, to Alberton or Wadeville in the south, or Roodepoort and Krugersdorp in the west.

Those folk are just going to have to pay the tolls.

Apparently people who use the road frequently will be entitled to discounted rates and this, too, is an anomaly because frequent road users may be putting more wear and tear on the highway. Sanral GFIP leader, Alex van Niekerk says this is not true as motor vehicles generally cause little or no wear on highways. The real culprits are trucks, particularly over-loaded trucks.

Electronic Toll Collection (ETC), a company owned jointly by Austrian-based Kapsch and its partner, Cape-based Traffic Management Technologies, will collect the tolls.

ETC will provide a turnkey service responsible for an open road tolling back-office, a transaction clearing house and a violation processing centre at a cost of R1,3-billion.

The technology used for open road tolling was apparently developed about 15 years ago and is used successfully in Singapore, Canada, Chile and Australia – countries that predominantly have law-abiding citizens too.

Apple sells a million iPads in a month

Apple has sold about one million iPads within the first month and this is less than half the time it took for the company to sell a million iPhones when they were launched several years ago, according to Steve Jobs, chief executive of the company.

The iPad is now being offered with 3G as earlier models were only capable of Wi-Fi connections. The demand for these devices in America has delayed the worldwide launch of the new tablet computer.

The computer offers speeds of up to 7,2 Mbps over a 3G cellular network. It has built in support for Microsoft Exchange, providing secure access to corporate data, and already developers are adapting existing iPhone applications to run on the iPad while a host of new products are also in the development phase.

Surprisingly the iPad has not incorporated the handwriting recognition software that Apple invested in years ago when it developed the Newton portable digital assistant. Despite having access to the software, Apple apparently refused to incorporate it in the iPad.

It shares some of the technology with the iPhone but it cannot be used as an oversized mobile phone because this functionality has not been included. It seems to be a bit like a Kindle or some other reader more than a fully functional computer but Jobs is confident that it will have a niche role in the market and, judging by the sales, it seems he might be right.

It comes with applications for e-mail, contacts and a diary, offers the Safari web browser as standard and is easily configured for use on networks. It is also bundled with iWork, Apples suite of software for word processing, presentations and spreadsheets but the software has to be purchased after the trial period at a cost of $9,99 each.

iPads are expected to be available in South Africa towards the end of this year.

Bono loses out as H-P buys Palm

U2 front man Bono's private equity venture invested about $460-million for a 30 percent stake in Palm when the handset company was struggling in 2007 and 2008. However, Hewlett-Packard has agreed to pay $1,2-billion for Palm and has valued its equity at $961-million and this means that Bono's stake is worth just $320-million.

In April, Palm was seeking investors to make up for the high marketing costs and the relatively poor sales of its latest smartphone, the Pre and held talks with Lenova of China and HTC of Taiwan before reaching a deal with H-P.

H-P, the world's largest computer company agreed to buy Palm as part of a determined strategy to provide a platform for H-P in the mobile phone market. Bono's company Elevation Partners has not commented on the deal with H-P.

Palm had hoped that its newest phone would rescue it from increasingly severe financial difficulties but sales of the phone did not meet projections. The Pre is an advanced handset with a slide-out Qwerty keyboard, a suite of applications for e-mail, maps and documents and many third party applications developed mainly for the Palm personal digital assistant.

It uses Palm's proprietary operating system, comes with a multi-touch screen, high resolution display and includes Microsoft Exchange e-mail. It has a built-in GPS, a three-megapixel camera, ambient light accelerometer, Wi-Fi and Bluetooth support.

Despite the host of applications available for it along with the relatively advanced operating system, users around the world opted for the iPhone, BlackBerry or Android phone in preference to the Pre.

However, H-P is confident that it will be able to use the Palm as the basis for its foray into the mobile phone market – one of the platforms that, until now, has eluded the company.

Concentrated Solar Power
– the small heliostat solution

By Peter Middleton

The eSolar CSP plant in Pasadena, Southern California, currently supplying 5,0 MWe of power to the Edison power grid

Eskom has now put out tenders for some of the components of its 100 MW Concentrated Solar Power (CSP) plant to be built just west of Upington in the Northern Cape. Peter Middleton talks to Clyde Mallinson and Jimmy Furstenburg of eSolar SA about utility scale solar power options and why Eskom might want to think twice before leaping into a CSP build programme based on its untested in-house design.

Part of the justification for Eskom's 'unconditional' World Bank loan is the commitment to spend US$260-million in renewable energy, 100 MW of wind and 100 MW of CSP. South Africa's solar resources are among the best in the world and new concentrated solar technology offers grid compatible solutions, capable, with storage, of hitting both of Eskom's peak demand periods. The only obvious obstacle to widespread implementation is cost.

"We differ a little from other developers in that we are trying to get away from the notion that we need massive support to get CSP going," says Mallinson. "Our aim is to get the price of solar electricity as low as possible, to make it as viable as possible." Ultimately, the goal is to achieve grid parity with coal. The new-build coal price, as opposed to the price calculated by blending in the costs of the debt-free older power stations, is already estimated at around 80 cents per kWh, or around 10 US cents, but coal is for base-load generation. The diesel powered OCGT at Ankerlig and Mossel Bay, used only to supplement the grid in periods of peak demand, are costing in the order of R280 per kWh.

"Our CSP technology is already achieving parity with oil- and gas-generated power, and is way better than the diesel-fired OCGT plants," claims Mallinson.

"Most CSP tower technology to date leans toward using larger and larger heliostats because of the cost of the drive technology to control it," he explains. "These are like big spotlights, made of parabolic mirrors of around 100 m^2, bigger than a tennis court. The drive mechanisms required for these to

track the sun tend to be large, expensive and difficult to calibrate," he says. The philosophy is that fewer larger heliostats result in a cheaper plant. On these plants, focal accuracy becomes a problem, particularly in the presence of wind.

Mallinson describes an alternative CSP technology developed by eSolar in the USA and currently supplying 5,0 MWe of power to the grid in Pasadena in Southern California. While building small (5-10 MW) R&D plants in the 80s and 90s in the USA, engineers became aware of the problems of scaling up to a 100 MW plant and the associated high costs. "eSolar believed that we were moving in the wrong direction. Instead of making large heliostats, it would be better to make thousands of smaller ones and find a cunning way of bringing down the costs of driving and calibrating them," he explains, ie, to make the drives and the calibration non issues in terms of cost. The solution involves a merging of CSP and IT technology. Small flat mirrors – 1,0 m^2 each or about the size of a plasma screen – are individually mounted on pedestals and driven by small stepper motors. Each mirror has its own IP address and is controlled by a central computer and some clever algorithms developed in Berkley. "Essentially, the whole grid of mirrors operates like a virtual parabola – a mosaic of individual heliostats, each individually focused at the receiver on top of the tower." — a solution born of the digital age, almost like addressing an individual pixel of a plasma screen.

By using smaller mirrors, you need 24 000 individual mirrors per tower, instead of 200 large parabolic mirrors, but you end up with a much more efficient and controllable solar heat source. "The pointing accuracy – sub-one milliradian – allows the sunlight to be targeted at specific points on the receiver, which then allows, for example, all of the mirrors to be aligned to hit the pre-heater on start up, to reduce start up times and first steam generation. During normal operation, by monitoring the heat radiation pattern on the receiver using infrared cameras, the mirrors can be concentrated or diffused to continually optimise the heat distribution pattern.

As a consequence of this controllability, there is no need to use expensive high temperature steels for the water tubes in the receiver. The risk of burn-through due to coincidence is mitigated.

Another key advantage of using smaller heliostats is installation. The heliostat field has no foundations and no ground penetration. The heliostats all sit on pedestals above the ground. "To install a heliostat field, we scrape the ground, lay down some grit or gravel for dust suppression and then we mount the heliostats on pedestals that sit about a metre above the ground," Mallinson

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explains. The pedestals come as plastic formers that can either be weighed with cement or with rubble. All the mirrors in a field are interconnected using triangulated steel structures giving the combined field the stability needed. "The system can continue to operate at wind speeds of 50 km/h and withstand wind speeds of up to 150 km/h," Mallinson claims. "Systems with bigger heliostats will begin to wobble at much lower wind speeds."

Calibration? "You need three targets in a triangle. You point the mirror at each of the targets to pick up its coordinates very accurately. Each position of each mirror is then associated with the IP address of the mirror itself. Software algorithms, which know exactly where the sun will be at any time, are used to accurately angle each mirror to reflect the sun onto the receiver tower. But this process is automated and a whole file can be calibrated in three weeks."

"Our objective is to go in exactly the opposite direction to a traditional power station's construction route," continues Furstenburg. "The design is modular, simple, scaleable, has no foundations and uses very little cement."

Each collector module contains a single tower with two heliostat fields, eg, a north and south field. Each tower, rated at approximately 10 MW thermal, would pass on 2,5 MW for electricity generation. eSolar believes that a 49 MW turbine is the ideal economical size. "Also, in selling around the world, by settling on a size, economies of scale can kick in and the costs reduced," he adds.

Sixteen 2,5 MW towers are therefore needed to drive one 49 MW turbine. "We use a 49 MWe turbine but, after parasitic losses of around 3,0 MW are taken off to drive the pumps, etc, we are able to supply 46 MWe to a power grid. In South Africa, we will also need about 10% of the gross output (another 4,0 MW) for dry cooling. We are not even considering wet cooling due to the water stressed nature of our country," Furstenberg explains. So 42 MW or multiples thereof are envisioned for the southern African market, each requiring 77 hectares of land.

The cost? "Without storage, US$4 000 per kW installed, and with, $5 000, ie R30 000 and R37 500 respectively. Medupi, at a currently estimated cost of R120-billion for 4 800 MW calculates to R25 000 per kW installed, which is not really substantially cheaper, certainly not by an order of magnitude. "Renewable energy also becomes cheaper over time simply because, unlike fossil fuels, once capital costs of plant have been settled, the primary source of energy is free. It is a case of taking some pain now to provide cheap and clean energy for the future," adds Furstenburg.

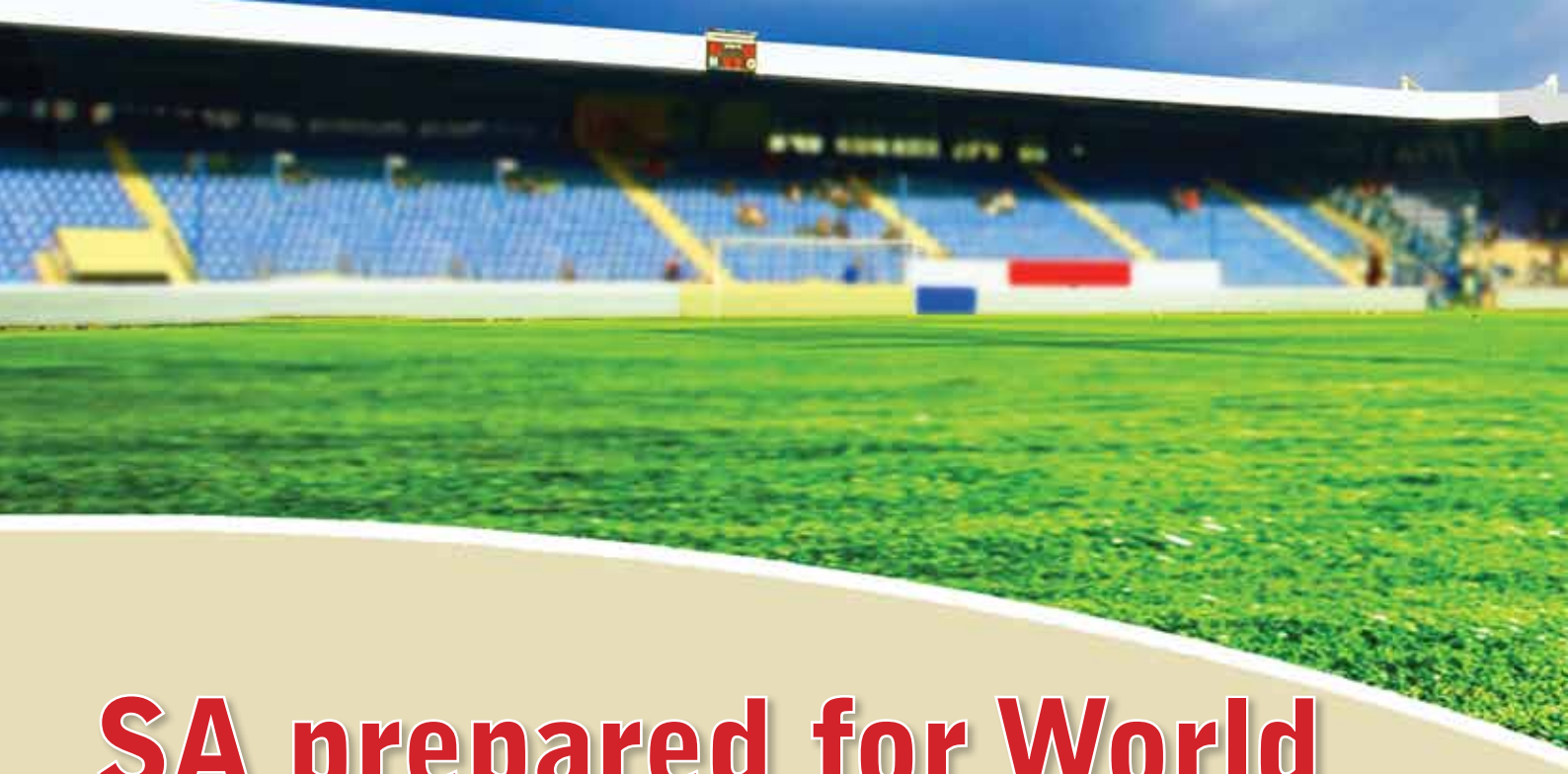
Mallinson believes that this technology is viable below currently published Refit Rates of R2,31 (with storage) per kWh. "After repayment of the senior debt, purchase agreements could be renegotiated at rates below expected fossil fuel electricity costs and still provide acceptable financial returns on investment, not to mention environmental returns through carbon reduction," he says.

This CSP technology is also ready for immediate installation. eSolar offers the heliostat fields and receiver towers, while Ferrostaal, the German EPC company, has a teaming agreement with eSolar to be the EPC partner for developers of plants in Spain, UEA and southern Africa. The total construction time is in the order of 18 months .

"South Africa has some of the best solar resources in the world and now has the opportunity to adopt the best CSP technology in terms of price, time to market and performance. This technology is innovative, cheap, deployable, scalable, and ready for use in this country. We can already supply a mid-merit electrical energy and by 2012 we will be ready to supply peak demand. All we need is a supportive regulatory environment," says Furstenburg.

I am enthusiastic about CSP technology. The sun, after all, is the primary source of all energy on Earth, Is it not a tidy solution to use that energy directly instead of relying on nature's processes over thousands of years to transform it into the fossil fuels we currently depend upon? I therefore welcome the development of the Uppington plant, no matter what technology will be used.

But do we need to always go with our own technology? We are importing huge percentages of the technology for the coal new-builds. Surely, as a first step towards harvesting our own solar resources, we can partner with a better tested technology for CSP?



SA prepared for World Cup but some under-currents are swirling

On the face of it South Africa is incredibly well prepared for the FIFA World Cup 2010. The stadiums are finished and in pristine condition; the broadcast facilities are in place to carry high definition, high speed signals to the watching world; the broadcast infrastructure is in place. All that the world is waiting for is the kick-off.

Added to this is the fact that at least 25 matches will be broadcast in full three-dimensional television for transmission to 3-D televisions sets around the world to bring the true football action into the lives of the people who can afford to buy 3-D televisions sets.

For the rest of the world who do not yet have 3-D receivers, the high definition pictures will be beamed to their sets and, woe betide, those few who do not have either of these new technologies, well they will just get wonderful pictures of every football match being played in 2010.

So the reality is that the infrastructure to cover all television sets, all mobile broadcasting and even the bulk viewing arenas with giant televisions sets in public areas are in place.

Telkom is providing the fixed-line telecommunications backbone for the 2010 World Cup and a huge volume of voice and data traffic will move over the FIFA event network. Telkom will be responsible for the operation, maintenance and satisfactory functioning of all telecommunications-related products and services.

In addition, Telkom provides the interconnection of important venues including the ten stadiums, the broadcast compounds, media centres, the International Broadcast Centre and the FIFA headquarters.

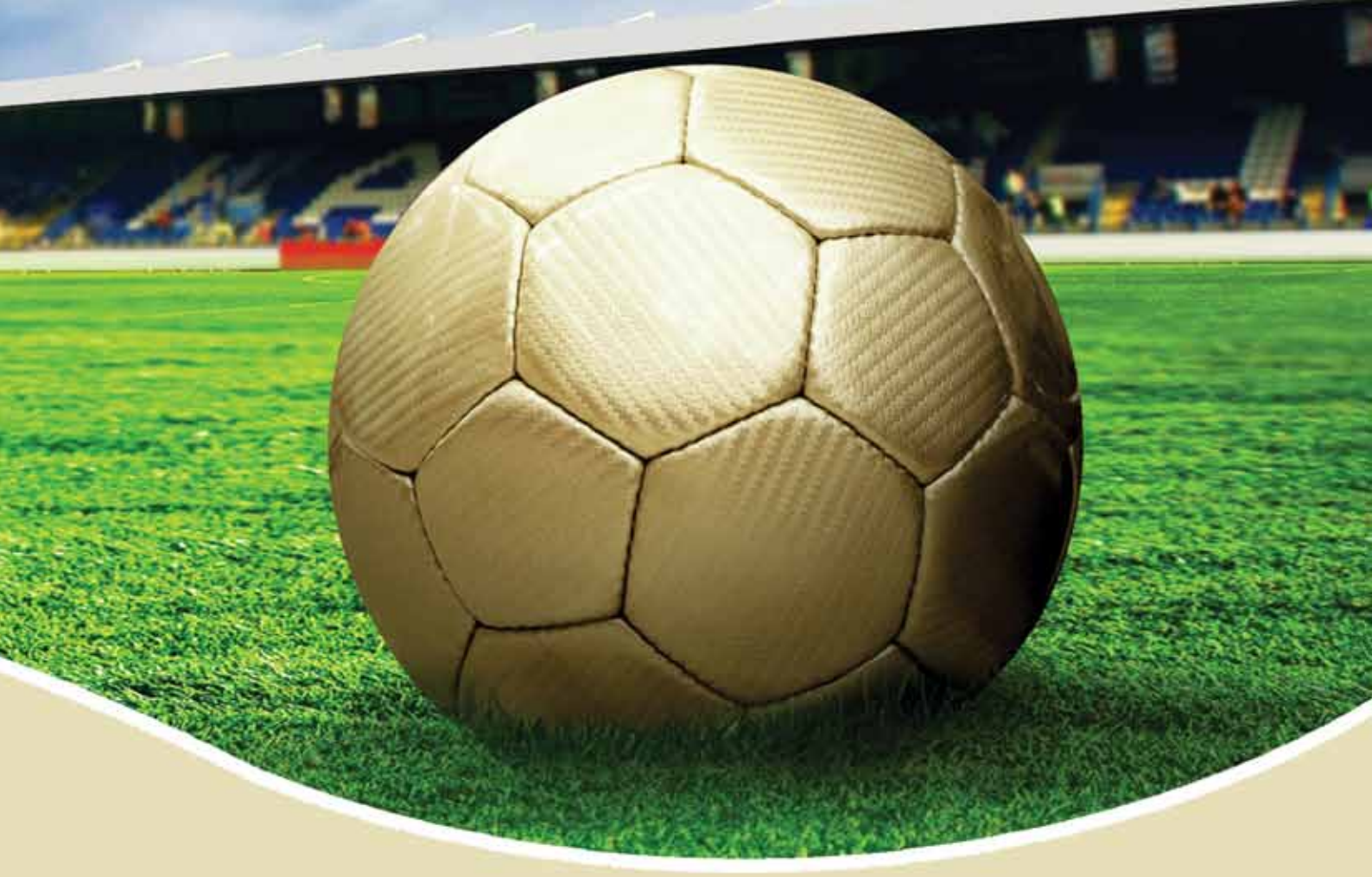
Telkom's network infrastructure will, according to company chief executive Reuben September, allow it to demonstrate that it is a world class telecommunications company that can rightfully hold its place against the best in the world.

September says that the investment made by Telkom in its network over the years ensures that the company is in a globally competitive position within the ICT sector, allowing it to provide faster state-of-the-art solutions and converged services to clients long after the FIFA World Cup is over.

Of course, what September doesn't say is that this comes at a price for South African consumers who are already burdened with some of the most expensive telecommunications charges in the world and are paying outrageous rates for Internet and converged services.

There is no doubt that South Africa has the bandwidth to make it globally competitive and with new undersea cables being added to the network it should translate into magnificent savings for the users. In truth, this hasn't happened, although several Internet Service Providers have started supplying slightly more affordable rates for uncapped Internet at reasonable speeds.

Of course, Telkom is determined to ensure that it performs extremely well during the 30-odd-day event and to do so has already informed some of its high-level customers that it would not conduct any planned maintenance or upgrades during the World Cup. In essence, it is saying: "To hell with you, the customers who pay our bills and keep us profitable, the World Cup comes first." Of course it's not said in so many words.



Telkom claims that it has clarified this statement by adding that it will run repairs and installations during the World Cup if customers are having trouble. Senior managing executive for wholesale and networks at Telkom, Bashier Sallie, adds that the network freeze imposed by Telkom is "an industry best practice" that is implemented during peak retail periods.

That's really nothing more than an excuse because if you are a high-level customer providing an exceptional service to a range of telecommunications clients and your system falls over for some reason, then the notion of "industry best practice during peak retail periods" becomes completely academic.

Sallie says that Telkom clients should not be concerned and should not anticipate any service disruptions.

I suppose that we will have to see what happens rather than attempt to predict the future, which is precarious at the best of times.

In much the same vein, Sentech, responsible for the broadcast signals used by television sets, says that it is perfectly prepared for this, the biggest sporting event to ever hit the shores of the African continent. But once again, beneath the rosy façade is a cauldron of mistrust, misgivings, dissatisfaction and doubt.

Earlier this year, government appointed a Ministerial Task Team, set up to investigate Sentech and the South African Broadcasting Corporation after the Minister of Communications, General Siphiwe Nyanda asked for a detailed investigation into the affairs of these state-owned companies.

The report was scathing to say the least. With regard to the SABC it found that:

- There is a gap between the board of directors and management;
- A lack of collective management and decision-making to such an extent that key decisions were centralised to a few individuals;
- Senior positions in the organisation were held by people nearing retirement age with no grooming of second tiers of management to keep the SABC running smoothly;
- The relationship between the public broadcaster and the shareholder (government) was reactive rather than proactive;
- Due processes were not adhered to, particularly when concluding agreements with service providers;
- Certain key business operations required central monitoring and management;
- There was no correlation between the SABC's business plan and its mandate;
- The SABC's business model is not sustainable and is not integrated.
- It was not using or observing financial systems that had been put in place, was heavily reliant on the office of the chief financial officer and no monthly financial reports were submitted to heads of divisions.

Since the findings of the Ministerial Task Team were published, a new board of directors and a chief executive officer at the SABC have

been appointed and a Shareholder Compact Agreement has been signed. In addition, the National Treasury has approved a financial guarantee for the organisation so that it can keep running.

The report on Sentech was even more scathing. In essence, the Task Team found that:

- The company is in urgent need of a turnaround strategy particularly as there is a misaligned business strategy to support the national service delivery agenda;
- Sentech appointed eight suppliers that were paid R13,6-million without following procurement processes and that its auditors found wasteful and irregular expenditure relating to the interest on a finance lease of R8,2-million undertaken without Treasury approval;
- The absence of a formal process flow linking billing, legal, sales and marketing, with the result that clients were not billed for services rendered worth R30,8-million;
- The former chief executive and two board members, including the former chairman, took a trip to Sweden in 2008 at a cost of R1,2-million. The task team was not provided with a business plan for the trip.
- The board approved a bodyguard service for the former chief executive without a signed contract and a full-time bodyguard was paid R262 126 a year. Moreover, a service provider was paid R945 844 for services not rendered;
- Sentech's management structure is disjointed;
- Sentech profits are declining in an environment where the company now has more than 300 competitors;
- That Sentech has unprofitable products and derives more than 75 percent of its revenue directly from the SABC.

The team came up with several strategic recommendations to correct the problems (apart from firing the chief executive and the entire board of directors). These included:

- Exploitation of Sentech's unused or under-used licences through public/private partnerships;
- Exploitation of the potential African market through selling of Sentech core competence in broadcasting signal distribution;
- Closure of all loss-making products and ventures.

Put simply, the Task Team described Sentech as "rudderless, inadequately funded and misdirected and that, in its current state it is an unsustainable business".

In March this year the Parliament's Communications Committee approved an allocation of R160-million to Sentech to continue rolling out its digital television transmitters (urgently required as South Africa migrates to the digital terrestrial television system).

Sentech's chief operating officer, Beverley Ngwenya has been appointed to act as the company's head until a new chief executive is appointed after the previous chief executive, Sebiletso Mokone-Matabane, resigned.

Nyanda has also appointed a new chairman, Quraysah Patel to take over from Colin Hickling and Mesuli Dhlamini, Zanele Hlatshwayo and Thabo Leeuw have been appointed to the board of directors. Slowly but surely government is clearing out the old management team responsible for running the company virtually into the ground.

Clearly Sentech is in a mess and, apart from the World Cup 2010, it throws the whole question of digital terrestrial television migration into question. But there are some positive factors for the immediate few months ahead.

For instance, South Africa will have its own communications satellite dedicated to the World Cup 2010 after international communication satellite operator, Intelsat agreed that IS-706 can be used exclusively to carry the high-definition broadcast signals from the event to the rest of the world.

Sentech built a special satellite uplink facility in Johannesburg to carry the signals to the IS-706, which is in a geosynchronous orbit above the Earth. The satellite is normally used for a range of services including providing telephony and Internet access but it has been freed-up entirely so that it can be dedicated to the World Cup.

Moreover, some broadcasters will take signals from South Africa via undersea cables while others have chosen to take the satellite feeds.

Of course the work that has been done for the 2010 World Cup is impressive. For instance, Telkom has completed two hubs or exchanges at each stadium and has dual fibre-optic routes from each stadium to the International Broadcast Centre.

According to Themba Magazi, Telkom's FIFA World Cup programme director, the telecommunications company is confident that it will honour all its obligations to FIFA, South Africa and the world.

He says the upgrading of Telkom's core network, with self-healing capabilities is in place and ready for use and the company is now completing the local area networks and related services so that these are fully operational when the event starts.

Upgrading of the undersea fibre-optic cables is complete and the SAT-3 and EASsy cables can handle three times more international traffic than previously. All routes from the stadiums to the International Broadcast Centre have network redundancies so that traffic can be re-routed via an alternative route should there be any damage to equipment or cables on the first route.

Telkom has established a National Network Operations Centre in Centurion to constantly monitor, detect and repair any faults that may occur on the network during the events.

There are other high-technology systems in place. For instance the

World Cup final at Soccer City will be among the 25 matches that will be broadcast in 3-D using seven pairs of dedicated cameras. In fact all three of Brazil's games will be among the 15 first-round games scheduled for broadcast in 3-D.

Moreover, the first-ever match to be broadcast in 3-D will be the opening game between Bafana Bafana and Mexico at Soccer City and four more of the 10 World Cup venues will participate in 3-D broadcasts. The other stadiums are Ellis Park Greenpoint, King's Park and Nelson Mandela.

The 3-D footage will be broadcast live to home viewers in 26 countries and to selected public broadcast areas. In South Africa fans will be able to watch 3-D matches at dedicated sites at Soccer City, Greenpoint and King's Park and at selected cinemas and fan festivals.

Sony is responsible for filming the matches.

In a separate development, mobile operator, MTN has invested R7,1-billion on upgrading its domestic network infrastructure for the World Cup and it has completed network coverage upgrades at all stadiums being used during the tournament.

Naturally enough, the SABC is the official broadcaster for the event and, as a result, other broadcasters have had to buy the rights from the SABC. Surprisingly perhaps, e.tv is not a rights holder for this event and will not be broadcasting any of the matches (live or delayed).

However, cable television company DSTV has confirmed it will broadcast all 64 matches live and will also run a 24-hour World Cup channel – in standard and high definition – in what has been dubbed as the biggest and most lavish production in SuperSport's 23-year history.

There will be four daily magazine shows on SuperSport, namely: Chase the Makarapa; Woza Lunchtime; Supernova and Harambee.

According to Tex Texeira, head of channels for SuperSport, this event will be the most technologically advanced broadcast in terms of picture clarity, the number of cameras used, the extensive use of replays, exceptional graphics and super-slow-motion pictures.

Apparently SuperSport will receive its live feed from HBS, the Swiss-based host broadcaster for the tournament. There will be 29 cameras at each event (excluding the 3-D broadcasts) and include an aerial camera and a slow motion camera capable of filming at between 300 and 1 000 frames per second in high definition, which is between 20 and 40 times more frames per second than standard camera.

SuperSport has also negotiated the rights to use the full content from FIFA's content library and will offer more than 100 hours of viewing of daily content. What this means is that SuperSport has full access to behind-the-scenes action that other broadcasters will not be allowed to broadcast.

There is no doubt that South Africa is prepared for the FIFA 2010 Soccer World Cup event and that the infrastructure is in place and the respective broadcasters are fully prepared to deliver a world class service. The question is what will happen once the excitement of this event dies down and it's back to business as usual in South Africa?

What we do know is that Sentech is in a mess and needs to have a serious look at its business, particularly in the light of the planned migration to digital terrestrial television.

What we also know is that while Telkom (and other service providers such as Neotel, MTN and Vodacom) have invested millions in the future of broadband through the installation and commissioning of new undersea cables and other inter-city networks, the reality is that South Africans are still paying through the nose for basic communications infrastructure and will probably continue to do so for the foreseeable future.

We also know that the SABC is in a mess and that it is struggling with a morass of internal issues that have kept it inefficient, intransigent and largely unapproachable.

Furthermore, government has provided much of the essential capital to Telkom (a listed company) through a R950-million guarantee that allowed it to build the infrastructure required at the stadiums.

What will happen to that infrastructure (guaranteed by government) once the event is over?

According to Magazi, Telkom has offered to buy back or fund some of the usable telecommunications-related equipment installed, using government money, and apparently there are discussions taking place between the Department of Communications and other stakeholders (Neotel, MTN and Vodacom) about how the network or equipment might be shared or used.

With a little bit of luck, the huge investment made in telecommunications infrastructure and improve broadcasting facilities will translate into some meaningful benefits for South Africa and the rest of Africa once the World Cup is over.

Like most things, though, it's a matter of time rather than speculation that will determine whether this happens or not.

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Planck captures new features of the Milky Way

New features of the Milky Way have been captured by Europe's Planck telescope and provide images that, so far, have been unseen by most other space observatories. The images show the gaseous and dusty fabric of the galaxy.

Apparently the images are 'by-products' for the Planck telescope, which must filter out much of the light that it detects to get images from the primary target – in this case a relic radiation emitted in the first few hundred thousand years after the Big Bang.

Artist image of Planck. Credit: ESA

The so-called Cosmic Microwave Background (CMB) fills the entire sky and retains fundamental information about the age, contents and structure of the cosmos.

Professor George Efstathiou, a team member working on the Planck telescope says that the primary CMB scientists wanted to remove all the galactic emission data, but rather than lose it, the great clouds of dust and gas that sit between the stars were analysed.

In one picture of the Orion Nebula, Planck's instruments see concentrated fronts of material where stars are actively forming and in a second image from a more sedate region of the Perseus Constellation, the structure of distribution of materials is much more diffuse.

The instruments work at a range of very long wavelengths in the radio part of the electromagnetic spectrum. Scientists probe these wavelengths to highlight particular features and at the lowest frequencies, the telescope sees the emission given off by electrons accelerating through the magnetic fields of Milky Way. At intermediate wavelengths, the light detected by Planck is dominated by gas that has been excited by newly-formed stars and at the highest frequencies in its range the observatory maps the emission coming from the coldest clumps of dust that trace matter falling in on itself to form new stars.

Planck's chief objective is to map the Cosmic Microwave Background. It was launched in May last year and its observing station is situated 1,5-million kilometres from Earth on it's 'night side'.

New magnet for an anti-matter detector

The anti-matter detector at the International Space Station is to have its liquid-helium-cooled 'heart' replaced with a long-life magnet and scientists expect that this will increase the time it can operate in space from three years to as much as 18 years.

The Alpha Magnetic Spectrometer will be carried to the space station on one of the final voyages of the Space Shuttle. The instrument is designed to search for anti-matter particles and markers of dark matter. It is being assembled at CERN.

It has more than 300 000 data channels and the detector generates so much data that it cannot actually transmit it all back to Earth. Because of this a super-computer is installed inside the AMS so that it can crunch the data while in orbit.

However, the computer pushes up the power requirements of the AMS to 2,5 kW, far beyond what a typical satellite's solar panels can produce but within the 100 kW power supply on the space station.

Samuel Ting, a Nobel laureate and physicist at the Massachusetts Institute of Technology is responsible for overseeing the 500-member multinational team of scientists involved in the $1,5-billion project.

Unlike the ground-based particle accelerators, the AMS samples high-energy particles from deep space and can detect particles with vastly higher levels of energy than those produced in particle accelerators on Earth.

The Large Hadron Collider at CERN can smash particles with a combined energy of about 7-tera-electronvolts or TeV while a cosmic ray, by comparison, can have energies that are greater than 100-million TeV.

The sensitivity of the AMS is a factor of 100 to 1 000 times more than previous instruments. Dumping AMS's cryogenic super magnet cuts the power of its magnetic field to bend the path of charged cosmic particles that pass through five different types of detectors.

The replacement magnet was part of a prototype AMS that flew on a 1998 Space Shuttle mission.

Computer-generated drawing of the AMS-02.

Biogas project:
changing lives in rural Mount Frere, Eastern Cape

In the rural Eastern Cape where electricity is often not available, life in a community can revolve around daily chores such as cooking and fetching water. When the only fuel available is wood, journeys to locate this dwindling resource can also take hours.

Schools are the centre of many communities. It was at the Three Crowns School near Mount Frere, that educationists and children launched an environmental outreach programme that resulted in the school winning a coveted 2009 *eta* Award in the Young Designers category.

An approach that included educating the children about the environment and alternative energy sources grew into community projects supported by a permanent community education centre.

The community centre includes a greenhouse in which the school grows seedlings, greenhouse bottles using recycled plastic bottles, two types of solar water heaters and a number of solar cookers, all of which are working models. In addition, the school has built a biogas digester to generate bio-fuel for the community.

Now, the prize money from the 2009 *eta* Award Young Designers category is being used to develop home-grown solutions to a major problem-ensuring that the children of the school get at least one nourishing meal a day at the school feeding project.

"We built on the success of our 2009 *eta* Award to make use of local energy sources," said Phillip Wilkinson of WESSA, who has been assisting with the project. "We believed that using basic technology would help solve our major problem. We had to ensure that the kids got at least one good meal a day."

Before the eta Awards win, Wilkinson explained, local volunteers cooked lunch in vats in the classrooms that had the only space available for the function. With the prize money and the help of locals, a separate kitchen and more classrooms were built. The search was then on for an alternative fuel to replace precious wood.

The solution lay in methane gas. Methane gas is naturally developed by biomass waste, a by-product of the Three Crowns gardening project. Linking this to pipes carrying methane gas from latrines provided clean cooking gas for the large vats.

"We simply looked at what we had available and tailor-made a solution," said Wilkinson.

Dr Steve Lennon, Eskom's *eta* Award champion, said that the efforts of the Three Crowns school showed effectively that 'necessity was often the mother of invention'. "We have here an example of how a poor rural community used what it had in the way of raw materials to develop energy efficiency solutions that have added greatly to the quality of life within the community.

"The inventiveness of this community is now being used as a template by other communities in the Eastern Cape. Many people will benefit. Their efforts display the spirit of the *eta* Awards. You can never be too young or too far from conventional electricity supplies to create and save energy. It takes an innovative spirit, some hard work and real benefits can be realised.

"It is this approach that Eskom, through its promotion of the *eta* Awards, which is now in their 21st year, is encouraging in industry, commerce and individuals across the country."

Early indications were that the 2010 *eta* Awards, for which entries close on August 6, would provide South Africa with more thought provoking, insightful energy efficiency and savings ideas.

"We expect that by submission closing date that the judges will have a bumper crop of entries. We anticipate too, that the awards to be made in Johannesburg at a gala event on 4 November will be more hotly contested than ever," he concluded.

To find out more about how your company can enter the *eta* Awards, visit www.eta-awards.co.za

For more information please contact:

amroux@mweb.co.za

Giant jellyfish spotted in Gulf of Mexico

Scientists operating a Remotely Operated Vehicle (ROV) have managed to capture a video of the Stygiomedusa gigantea, a jellyfish with a disc-shaped bell that can be up to a metre wide with four arms that extend about six metres below it. It is the biggest deep sea jellyfish found in the ocean.

These creatures have apparently been spotted 114 times in the past 110 years. Professor Mark Benfield from Louisiana State University in Baton Rouge came across the creature while working on the Serpent project, a collaboration between marine scientists and energy companies in the Gulf of Mexico.

Using ROVs provided by the oil companies, Benfield explored the deep ocean area in search of the mesopelagic and bathypelagic layers of the sea. It was in a similar study with similar vehicles that scientists recently captured footage of the serpent-like oarfish, the largest fish on the planet.

Not much is known about the jellyfish except that it is thought to be the largest invertebrate predator in the deep-sea ecosystem. It is the first time that this creature has been seen in the Gulf of Mexico as previous sitings were off the Pacific coast. There were four chance sitings between 2005 and 2009.

Benfield and his team captured footage of the jellyfish attaching itself to underwater equipment using what look like flattened, paddle-like arms. Scientists do not know what the arms are used for but suggest that they might envelop and trap pray.

By looking at previous studies, Benfield and his colleagues conclude the species is relatively widespread as there are records of it in all the oceans except the Arctic.

UCT researchers develop new silicon ink

Researchers working at the University of Cape Town have developed a technology that uses nano-particles of silicon in ink to screen-print semi-conductors onto various materials including paper. This means that it may soon be possible to have recyclable paper calculators or see moving pictures on a paper poster.

UCT Professors, Margit Harting and David Britton, working with senior students and with supportive funding from the Innovation Fund, have been able to develop the technology and their work has been recognised by winning the Academic R&D Award at the IDTechEx Printed Electronics Europe Awards 2010 announced in Dresden recently.

The potential applications for printed electronic products are enormous and include solar cells, animated billboard posters to packaging and smart fabrics that can monitor muscle fatigue during training.

The researchers have managed to produce semi-conducting inks using silicon nano-particles that do not oxidise at room temperature and it's this development that provides the tremendous commercial potential of the technology.

Apparently the biggest problem with semi-conducting inks for engineers is that the silicon nano-particles would react with oxygen in the air and become unstable. However, Harting and Britton were the first scientists in the world to print nano-particle ink onto paper and other substrates and have it work as a semi-conductor at room temperature.

Harting's and Britton's ink was stable in air for a period of more than two years. Britton says the team could achieve this because it understood the basic physics and material science of the nano-particles.

Already Harting and Britton have attracted hordes of potential investors, each to get their hands on the technology used to make these inks.

Biofuel emissions four times higher than diesel

Biofuels such as those made from soy beans can be contributing up to four times more climate warming emissions than a standard diesel or petrol engine according to a European Union document released under the Freedom of Information laws.

The EU has set itself a goal of achieving ten percent of its road fuels from renewable resources such as biofuels by the end of the decade but it is now said to be deeply concerned by the unintended environmental impact of biofuels releasing higher climate-warming emissions than fossil fuels.

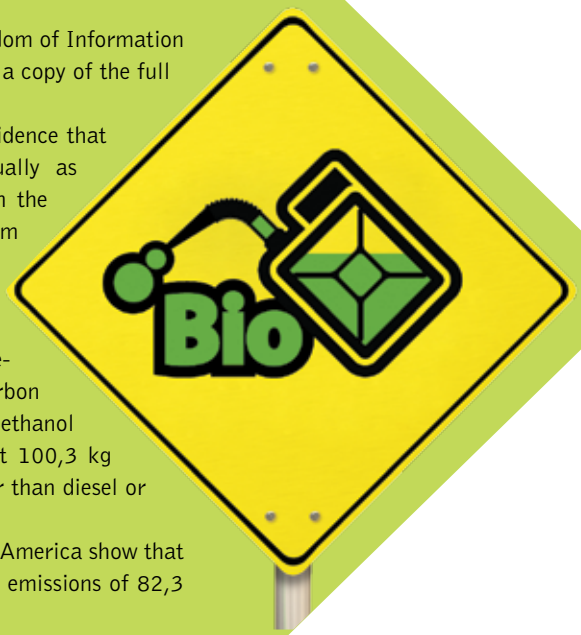
According to the EU report, biodiesel produced in North America from soy beans has an indirect carbon footprint of 339,9 kilograms of carbon dioxide per gigajoule, which is four times higher than that of diesel.

One of the consultancies responsible for editing the report, Fraunhofer of Germany, actually published a disclaimer, disowning the report that had been kept secret. Using the Freedom of Information laws, Reuters was able to obtain a copy of the full report and publish its findings.

There is a growing body of evidence that suggests biofuels are not actually as green as once thought and even the more advanced fuels, made from wood chips, contribute significant emissions to the atmosphere.

Biodiesel from European rapeseed produces 150,3 kg of carbon dioxide per gigajoule while bioethanol from sugar beet is calculated at 100,3 kg per gigajoule, considerably higher than diesel or petrol that is around 85 kg.

Imported biofuels from South America show that sugar cane and palm sugar have emissions of 82,3 kg and 73,6 kg respectively.



Ancient magnetic field evidence found in Barberton

By examining ancient dacite rocks from the Barberton mountains in South Africa, scientists have been able to push back the date of the earliest known presence of a magnetic field on Earth by about 250-million years.

Analysis of the minerals – estimated to be about 3,4-billion years old – shows that the field was much weaker than it is today. The magnetic field around the Earth helps to protect all life on the planet as it forms a shield to deflect harmful particles from the sun and helps to prevent solar winds from eroding the atmosphere.

Professor John Tarduno and his colleagues carried out the research into the ancient minerals from the Barberton mountains and developed a technique for studying the tiny magnetite minerals trapped inside the crystals of the volcanic rock.

The minerals orientate themselves with respect to the Earth's magnetic field in a cooling magma and lock their positions once the temperature in the host rock drops below 580° C. The Barberton samples indicate the nascent field was considerably weaker than today's protective shield

The research indicates that while the modern boundary between Earth's magnetosphere and the solar wind is located at about 10 Earth radii, the ancient boundary was much closer at between three and five Earth radii.

He says this would have produced auroras at much lower latitudes as many more solar particles breached the shield to collide with molecules in the atmosphere. It may also have led to the atmosphere losing some of its lighter elements, such as hydrogen, faster than had been previously supposed.

The team of researchers is now looking back into the deeper past for evidence of a global magnetic field.

Apparently convection currents in the molten-iron outer-core of the planet generate the field and the researchers believe that finding evidence of an even more ancient field would say much about the interior state of the Earth when it was young.

Elephants are really scared of bees

It seems that it's not just humans that are scared of bees. Elephants, despite their enormous size and extremely thick skin, are actually terrified of these little creatures that tend to sting them in vulnerable spots such as around the eyes or on the inside of the trunk. Scientists have even found that elephants have a particular, rumbling, alarm call that warns when bees are approaching and may be threatening a herd. The study, led by Lucy King of the University of Oxford and the charity group, Save the Elephants, is part of an ongoing project in Kenya that aims to reduce conflict between farmers and elephants.

Ms King says that during the study, researchers found that elephants flee from the buzzing sounds of a swarm of bees and they also give off a low, rumbling call while shaking their heads. She says that the sounds might be an emotional response to the threat that bees pose.

The researchers are looking for a practical, low-technology deterrent to stop elephants from raiding crops or invading planted fields. Farmers in Kenya are becoming increasingly infuriated with elephants that destroy their agricultural produce, and have taken to shooting, poisoning or spearing these creatures.

By mimicking the sound of the bees, the researchers hope that they might be able to keep elephants away from farmers.

Oxytocin may make men more empathetic?

Scientists working at the Neuromudlation of Emotion faculty at the Friedrich-Wilhelms-University of Bonn have invented a sensitivity spray that they claim will turn macho male hunks into baby-huggers and kissers who will stop popping down to the pub on a whim. The spray uses the oxytocin hormone – sometimes referred to as the cuddle chemical – that stimulates affectionate feelings in human beings. The scientists worked with their colleagues at the Babraham Institute in Cambridge to develop the spray.

In experiment, 24 healthy men took nasal sprays containing oxytocin while 24 others received the placebo. Then the men were shown emotionally charged photographs that included pictures of a child crying, a young girl cuddling a cat and a man in mourning.

The participants had to then describe the level of empathy they felt with the subjects in the photographs. According to Dr Ren Hurlemann in Bonn the oxytocin group showed significantly higher emotional empathy levels than those men who had used the placebo.

He says the men who had used the hormone spray showed levels of sensitivity that were equivalent to the sensitivity found in females.

Oxytocin is a mammalian hormone, which evokes feelings of contentment and reduce anxiety and it is best known for its role in female reproduction and is released in large amounts during breastfeeding and labour and helps a mother to bond with her child.

The same hormone is used to alleviate some of the symptoms of autism.

Water flow equivalent to 40 Amazon Rivers

Scientists working in Antarctica have discovered a deep ocean current that has the volume of about 40 Amazon Rivers and they are using the current to monitor the impact of climate change on the world's oceans. The team of Australian and Japanese scientists found that the current is a key factor in the global circulation of the oceans. Steven Rintoul of the Antarctic Climate and Ecosystems Co-operative Research Centre based in Hobart says that this is the fastest moving deep ocean current found so far.

It travels at an average speed of 20 centimetres a second and carries more than 12 million cubic metres of very cold, salty water a second. It is moving at a depth of about three kilometres below the ice.

The current carries dense, oxygen-rich water out to the deep ocean basins that lie further north at the Kerguelen Plateau in the southern Indian Ocean before it branches out.

The current is just part of a much larger network of deep currents that circulate through the oceans, functioning like a huge conveyor belt that distributes heat from hot parts of the globe.

For instance, the Gulf Stream brings warm water to the North Atlantic and this results in northern Europe having a relatively mild climate. However, if the Gulf Stream fails to bring warm water northwards then it plunges Europe into a deep freeze as has occurred at several times in the past.

Rintoul says that the deep current that runs along the Kerguelen Plateau is part of a global system of ocean currents called the overturning circulation, which determines how much heat and carbon is soaked up in the oceans.

To make the measurements, the team used measuring devices anchored to the sea floor at depths of up to 4,5 km to determine how much water the deep current carries northwards. The key question being asked by scientists is whether the overturning circulation will remain at present levels or whether it was sensitive to changes affecting the global climate?

South African waste water treatment crisis

South Africa waste water management industry is in a mess – or as the executive summary in the recently released Green Drop Report succinctly puts it is far from acceptable when compared with the required national standards and international best practices.

The waste water management sector in South Africa has an estimated capital replacement value of more than R23-billion and an estimated operation expenditure of more than R3,5-billion a year.

According to the report only 449 of the 850 municipal treatment plants in South Africa were surveyed because municipalities either refused to be assessed or the municipal officials were not sufficiently confident in their levels of competence to be subjected to assessments.

In essence, what the report is saying is that the skills levels and competencies of the employed officials are below par and that the municipalities themselves are simply not purifying their water. This sort of jargon is deeply concerning when one considers the seriousness of impure, unclean water being circulated to the communities of South Africa.

The report goes on to say that municipalities are not managing waste water services "according to the expected requirements" (read: properly) and as a result are not in possession of the management information required for the Green Drop Report (read: incompetence).

The report is quick to try to praise those municipalities that are producing decent clean water. It claims that "pockets of excellence" in waste water treatment and management are evident across the country and six out of 169 water service authorities managed to obtain Green Drop status. That is equivalent to 3 percent.

Forgive my cynicism but that means that 97 percent of the waste water treatment plants are not up to standard and are recycling water that might not necessarily be treated to a sufficient level to be considered clean.

The report goes on to provide other mystifying statistics:

- There were 203 waste water service systems (of the 449 assessed) that scored better than 50 percent against the measurement criteria set. Sounds impressive but if you consider that 203 out of 850 waste water treatment plants in South Africa achieved better than 50 percent (the water was nearly clean) then that's just 23,8

percent. And that means that 76,2 percent of the waste water treatment systems are not cleaning South Africa's water properly.

- The Green Drop Report expresses concern (I'd call it horror) at the fact that 55 percent of the systems that scored between 0 percent and 49 percent indicates that a drastic improvement is required.

The Report openly admits that the waste water treatment performance was generally poor and this is supported, it says, by the relatively low number of Green Drop certifications and the poor scores obtained by the majority of Water Service Authorities. Just 7,4 percent of all authorities in South Africa achieved some form of certification.

The Report goes on to concede that skills shortages exist at all levels from managerial to junior operational and the result is that many plants are not being correctly operated and the resultant effluent water quality is no longer compliant (read: unsafe).

To further complicate matters, there is apparently a poor understanding of the technicalities of waste water treatment and because the majority of the treatment plants fall under the management of senior officials in the municipalities, the needs of the plant and its operators are not prioritised (read: largely ignored).

To complicate matters, the Report goes on to say:

- There is a lack of understanding of the funding requirements for waste water treatment works and this is exacerbated by the municipal procurement procedures and as a result financial support for dealing with urgent issues at plants is, in many cases non-existent. (Read: no chemicals, broken equipment, no maintenance).
- Maintenance of the infrastructure has become a luxury rather than a necessity. (This is what the Report actually says). Thus, by implication, clean water is a luxury, not a necessity. Try telling that to a mother whose baby has just contracted dysentery and see if she regards clean water as a luxury.
- The state of the bulk plants can be described as poor to non-functional. In many cases, says the report, extensive refurbishment and expansion of the current plants is required. Moreover, in many cases the processes employed at the plants are no longer sufficient to deliver the required final water quality (read: clean water).
- Many of the municipalities had no information on the waste water treatment works they are responsible for and as a result, any attempt to control the plant or ensure that the water quality complied with minimum standards was completely null and void because the plants cannot verify the status of the water they put back into the pipes.

Although the Green Drop Report is remarkably politically correct in what it has published, the reality (once all the jargon has been stripped from the carefully worded sentences) is that South Africa's waste water treatment is a complete farce and that, increasingly, bad water is being circulated to unsuspecting residents who believe, naively, that the water from the tap is actually clean and drinkable.

It is not – at least not according to the Green Drop Report except in (at best) seven percent of the country and at worst, in just 3,6 percent of the municipalities.

Clearly South Africa is facing a water crisis of astronomical proportions and, when this is coupled with the skills shortages that exist in this specific industry, it is a problem that cannot be easily overcome. The skills that once ensured that water was treated properly have clearly been lost to the municipal authorities and replacing these skills is another huge problem that has to be overcome.

Where are the engineers, the technologists and the technicians who were trained to do the work properly? They surely cannot have evaporated.

New ballast offers energy savings of almost 75 percent

While there is mounting political support for the use of energy efficient lighting throughout South Africa, the reality is that too few industrial companies or property management organisations are actively promoting the use of effective lighting solutions, claims Tony Smith, chief executive of Switch-It-Off.

His company is distributing new, highly efficient ballasts used in fluorescent lights and he claims that energy savings of more than 70 percent can be achieved through the use of this newer technology.

"When one considers the vast number of fluorescent tubes that are in use in industrial companies, shopping centres and office blocks, it's evident that savings from a more efficient ballast would make a significant contribution to reducing energy consumption in South Africa," he says.

The United States Department of Energy estimates that 19 percent of all electricity in the world is consumed by lights with the European Union consuming about 14 percent and the United States using 22 percent.

Referring to climate change and the dangers of carbon dioxide emissions, Smith says that South Africa's energy production, based as it is on coal, ejects 0,997 kilograms of carbon dioxide into the atmosphere for every kilowatt hour of energy produced.

"This makes South Africa a major polluter because more than 85 percent of the electricity generated in this country comes from coal-fired power stations that burn hundreds of tons of coal a year," he says.

He says that Eskom is on record as saying that it wants to save at least 3 000 MW of power over the next six years through the demand-side management initiatives that are being implemented countrywide.

He says that by using a combination of a more energy efficient lamp and the new technology Daytronic ballasts in fluorescent luminaires, a minimum saving of 40 percent on all fluorescent luminaires currently installed in South Africa could be achieved.

"Currently all fluorescent luminaires are on at full power whether there is ambient light or not and this is a waste of energy, given that South Africa has an average of 288 days of sunshine a year," he claims.

"This would translate into savings of about more than 13-million tons of carbon dioxide emissions each year, reduce expenditure on electricity by about R5,3-billion and provide annual power savings of 14,8 GWh, equivalent to the entire output of three medium sized electricity generating plants," Smith claims.

He says that while lighting technologies have improved dramatically over the past 15 years, about 75 percent of all lighting currently installed in South Africa relies on the older technologies that were developed in the 1960s or even before that.

"The current change-over rate to new lighting technologies is particularly slow and in offices, for instance, the estimated rate is just five percent a year," he says.

"One reason for this lethargy could be the relatively high cost of changing from a magnetic to an electronic ballast luminaire. By using a Daytronic ballast luminaire, an immediate saving of 25 percent can be achieved and then a further 60 percent can be saved from daylight harvesting. If the luminaire is coupled to an occupancy sensor, further savings can be achieved," he claimed.

Smith contends that less than 20 percent of office lighting systems is energy efficient and, even worse, does not comply with the quality standards set down for office workers.

The new Daytronic ballast system that Switch-it-Off is distributing provides for daylight harvesting, and active and dimmable electronic drivers to set lighting levels using an integrated sensor on a luminaire basis, which provides for easy installation without needing to be set up. All full range-of-occupancy sensors complement the ballasts.

Smith and his colleagues conducted a detailed trial at the parking garage at a new 'green' head office complex and found that the power consumption of the luminaires in

the parkade, without daylight harvesting, amounted to 109,7 Watts whereas, with daylight harvesting, this dropped to 29,3 Watts, equivalent to a 74 percent saving of energy.

"The advantage of daylight harvesting—apart from the energy savings—is that the correct lighting levels can be achieved at all times, regardless of the time of day, or the prevailing climatic conditions," he says.

Smith says that fluorescent lighting systems are used predominantly in office blocks, factories, parking garages and shopping centres and the savings that could be achieved by using the more technologically advanced ballasts would make a significant contribution to Eskom's demand-side management initiatives if they were widely deployed throughout the country.

"It has been shown that by changing to compact fluorescent lighting lamps, major energy savings can be achieved, and if the same platform were to be given to fluorescent fittings, even more savings could be achieved in a relatively short time," he claimed.

"South Africa cannot afford to maintain the wasteful attitude to energy that seems to prevail. Electricity prices have risen by more than 25 percent this year and will continue to do so in future. So cheap electricity is a thing of the past.

"More importantly, the only way that South Africa is going to cope with the rising demand for energy, is through the efficient use of the available energy resources. It is imperative for the country's sustainable future that energy consumption is reduced and efficient lighting systems can certainly contribute to resolving the problems," he says.

Anyone interested in finding out more about the Daytronic ballast system can contact Tony Smith at tony@switchitoff.co.za

SANEA

The South African National Energy Association

Energy People Working Together

The South African National Energy Association (SANEA) has as its vision "Energy People Working Together".

SANEA strives to promote the sustainable supply and use of energy for the greatest benefit of all and to be acknowledged as a credible centre of knowledge, expertise and opinion on energy matters.

SANEA is a non-partisan, diverse energy association with international networks through the World Energy Council (WEC). WEC has member committees in over 90 countries. SANEA is playing a pivotal part in the future of energy in South Africa, bringing influential role-players together with a view of identifying and implementing sustainable and effective solutions, providing factual and relevant data and knowledge,strengthening the energy network in South Africa and globally, and enhancing awareness of energy issues in South Africa.

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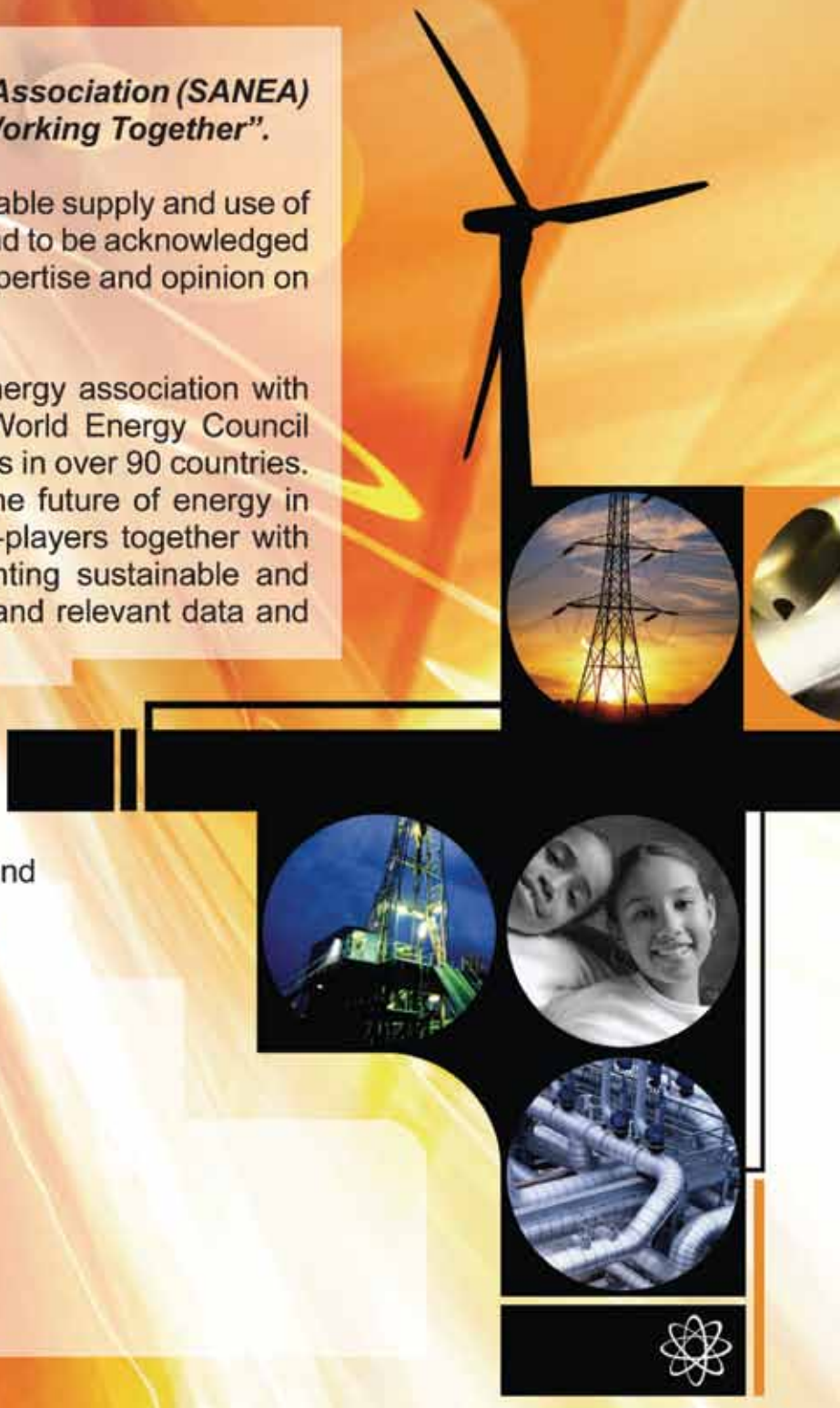

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Europe sets standards, Mauritius builds charging stations

The European Union has set out 40 practical actions that are required to develop a set of standards for manufacture of electrical vehicles. French car manufacturer, Renault has already joined forces with California's Better Place in a project that will put electric cars and the charging infrastructure on the roads of Denmark and Israel by 2011.

According to the European Union's industry commissioner, Antonio Tajani, electric cars are no longer a "curiousity at motor shows" but are keenly awaited by members of the public who want to stop using fossil fuel vehicles.

He says that electrical safety standards should be in place by the end of this year, standards for charging electric cars will be set by 2011 and crash risks will be reviewed by 2012 – including risks that arise from the silent operation of the vehicles.

In a completely separate development, Mauritius is to open its first demonstration charging plant for electric vehicles later this year and according to Supercharge chairman and chief executive, Dr Revin Panray Beeharry, the vehicle chosen for the test phase is Nissan's Leaf.

Supercharge is a private company that is planning to roll out and operate the infrastructure for electric vehicles on the island. Mauritius is an ideal spot for electric vehicles as the residents drive distances of just 80 kilometres a day. The range of most electric vehicles is more than sufficient for these distances.

The Leaf can be charged via a standard household socket and considering that the entire island has a surface area of just 2 000 square kilometres, it is ideal for electric vehicles.

There are 110 000 cars in Mauritius. Moreover, 90 percent of vehicles are parked in garages overnight and as a result, recharging them will be a straight-forward task.

According to Beeharry, there will be about 20 fast-charging stations in the country. Payment will be made via a card and billed on a monthly basis. He estimates the running costs of a Leaf at 25 South African cents per kilometre, which is considerably less than the 70 cents that it costs to run a petrol or diesel vehicle.

Areva keen to develop solar power in South Africa

French energy company, Areva, is keen to develop its solar power business in South Africa since buying the United States-based Ausra solar thermal company earlier this year.

According to Areva's business development senior vice president, Tom Bartolomei, the company wants to focus on renewable energy opportunities in this country because between 60 and 70 percent of the materials and services can be locally acquired.

He says that South Africa has tremendous solar potential and the government and legal frameworks are evolving quickly, particularly as the South African government has committed itself to reduce emissions by 34 percent by 2020 and by 42 percent by 2025. The commitment was made at the Copenhagen According.

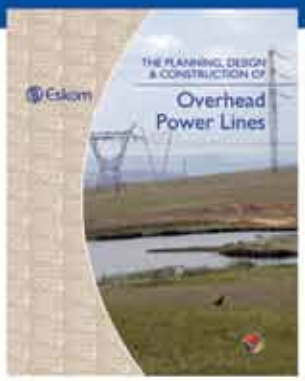
The World Bank is currently financing a White Paper on the future of renewable energy being undertaken by the Department of Environmental Affairs.

Areva's core technology is the compact linear Fresnel reflector solar collector and steam generation system. It uses modular flat reflectors to focus energy from the Sun onto elevated receivers. Water flows through a system of tubes.

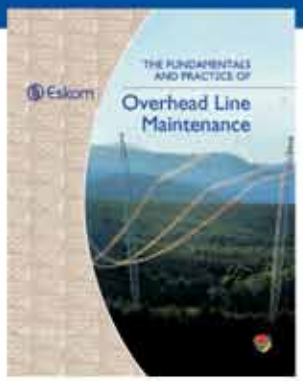
The concentrated sunlight boils the water, generating high-pressure steam and this is used to generate power. The steam generators retain heat, allowing for a more seamless integration with the national power grid.

Areva seems to be pretty confident about the future of solar concentrated power and Bartolomei says the market for engineering services in this sector is likely to expand rapidly over the next ten years. He forecasts growth of about 20 percent and, by 2020 as much as 20 GW of power could come from this renewable energy technology.

Areva is, naturally enough, bidding for the extension of South Africa's nuclear power capacity. The one project is to build a new nuclear plant (probably in the southern Cape region) with the capacity of between 3 000 and 3 500 MW and the second is to produce a range of smaller power stations that will, by 2025 have the capacity to generate an additional 20 000 MW.



Volume 1: The Planning, Design and Construction of Overhead Power Lines



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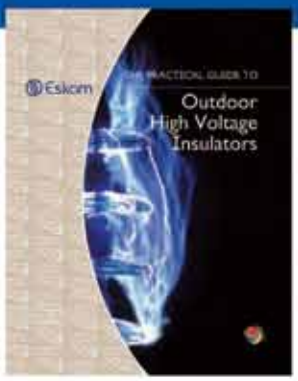

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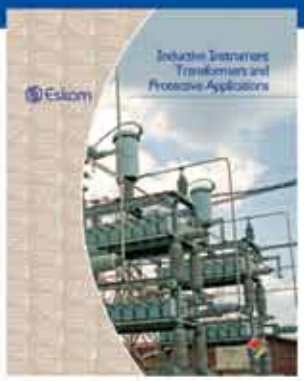

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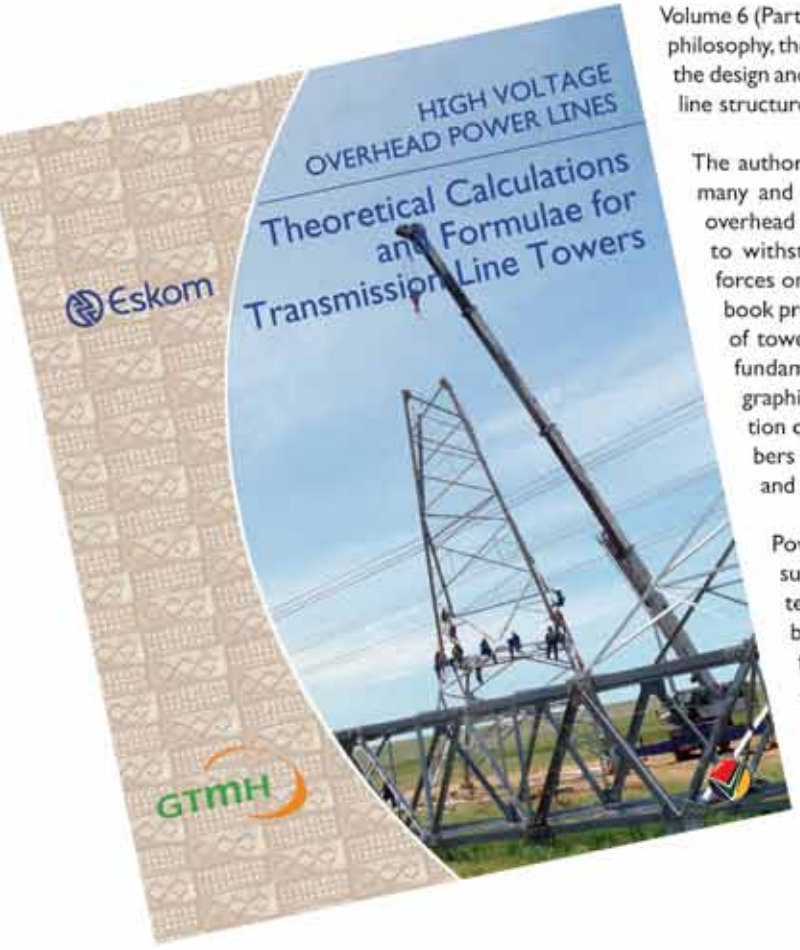
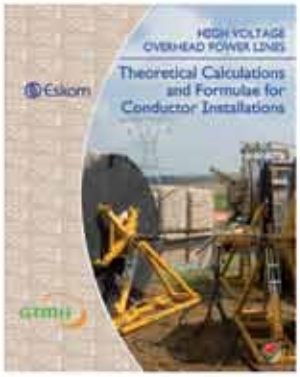


Volume 6 (Part 2) takes the reader through the philosophy, theory, principles and practices of the design and fabrication of overhead power line structures.

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.

Volume 5: Theory, Design, Maintenance and Life Management of Power Transformers



Volume 6: High Voltage Overhead Power Lines: Theoretical Calculations and Formulae of Conductor Installations

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Eskom

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Eskom confident that it can raise R200-billion

Eskom needs to raise a further R200-billion for its planned building programme of the next seven years according to the utility's chief financial officer, Paul O'Flaherty. He was addressing members of the Portfolio Committee on Public Enterprises.

O'Flaherty confirmed that costs at the Kusile power station had rocketed from the original estimate of R80-billion to R142-billion and blamed delays and higher interest charges for the increases – although he didn't say how the escalation could be more than 50 percent above the original estimate.

He warned members of the Committee that the World Bank was unlikely to fund further coal-fired power stations and noted that Eskom currently needs to boost generating capacity from 41 000 MW to 58 000 MW within the next seven years, followed by a further 8 000 MW by 2020 and 17 000 MW more by 2025.

By then the total electricity production will reach an astronomical 83 000 MW.

According to O'Flaherty, Eskom is looking to save at least R10-billion over the next three year through cost reduction measures but he did not say what these were.

From a demand perspective, Eskom is estimating growth in demand of between 2,5 percent and 3 percent a year between now and 2025 and in view of this growth, additional power generating capacity becomes even more critical.

O'Flaherty says that Eskom will not ask the government for additional guarantees but will look to finance further capital expansion through the domestic and international bond markets.

In a separate development, Eskom dismissed speculation that a 'secret dossier' had been leaked to the media saying that the document in question was an internal business report used by the company to track progress on projects.

This document shows that BHP Billiton's smelters consume 9,3 percent of all electricity generated by Eskom, making it the single biggest user of electricity in the country.

The long-term pricing agreement has been amended for the supply of electricity to Mozal in Mozambique and to the Hillside and Bayside smelters in Richards Bay.

The company currently enjoys vastly discounted rates for electricity.

Namibia, Angola to build new plant at Baynes

Namibia and Angola have signed an agreement to jointly develop a $1,1-billion hydroelectric power plant on the Kunene River that is the border between the two countries. The project includes a hydropower plant and a storage dam and is expected to start generating power by 2017.

Known as the Baynes Project, private investors will be invited to participate in the hydroelectric power plant. Environmental and feasibility studies are being undertaken for the 400 MW plant.

The project is aimed at resolving power disruptions that have plagued both countries for many years. The original plan was to build a power plant on the Epupa Falls about 40 kilometres north of Baynes but these were shelved about 15 years ago after objections from the nomadic Ovahimba community who live in the area.

Namibia's demand for power is expected to increase threefold over the next 20 years as new mining operations come on stream. Angola relies heavily on hydro-electric power for its energy needs and is investing billions of dollars in rebuilding dams that were wrecked during the 27-year long civil war that devastated the country.

At this stage only about five percent of the estimated 18 000 MW of hydroelectric power in Angola is available to the local population because of the damage to plants and dams.

WATTnow

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 quality 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

Aluminium cables are a cheaper alternative than copper

by Robin Coombs, a consulting electrical engineer specialising in process plant studies, cost estimates and electrical design audits.

Ever since the introduction of aluminium-cored electrical cable, cost savings have been the sought after 'pot of gold'. The price of copper on the London Metal Exchange (LME) sky-rocketed, adding fuel to the fire.

Aluminium cables have been shunned due to poor performance in the past, mainly the result of lack of knowledge. BHP Billiton used aluminium cables very successfully in their two giant aluminium smelters in Maputo and Richards Bay. The main criterion for the use of aluminium cable was the cost savings due to the vast majority of cables installed being greater than 16mm².

According to ***SANS 10142-1:2003***

Para 6.3.1. "All conductors of nominal cross sectional area less than 16mm² shall be of annealed copper"

Para 6.3.2.1. "Conductors of nominal cross sectional area exceeding 2.5mm² shall be stranded, except in the following cases, where solid conductors may be used"

(e) "Aluminium conductors of nominal cross-sectional area of 16mm² or more"

Size for size, the cost of aluminium cable is considerably lower than the cost of copper cable, but there are many other factors to be considered.

Aluminium cables come in either solid or stranded configuration.

The object of this report is to highlight both the positive and negative factors involved in selecting aluminium cables for use in a project.

The cost of manufacturing stranded cable is greater than solid so that solid aluminium cable is used more frequently than stranded. Large solid copper cable would be almost impossible to bend and is not allowed. Both stranded and solid aluminium cables, larger than 16mm², may be used. Deep indent crimping cannot be used on stranded cable so hexagonal crimping must be utilised. For the sake of this report, stranded aluminium cable is ignored.

The main difference between aluminium and copper cables is the current carrying capacity and impedance. Aluminium cable has a lower current carrying capacity and greater impedance than the equivalent copper conductor. Further, aluminium cable is only available from size 25mm² and up in South Africa. (NOTE: aluminium cable in sizes smaller than 25 mm² is available in other countries and is used prolifically in India). When selecting the correct size of aluminium cable the impedance must be carefully evaluated.

Figure 1: Solid Aluminium Cable and Stranded Copper Cable.

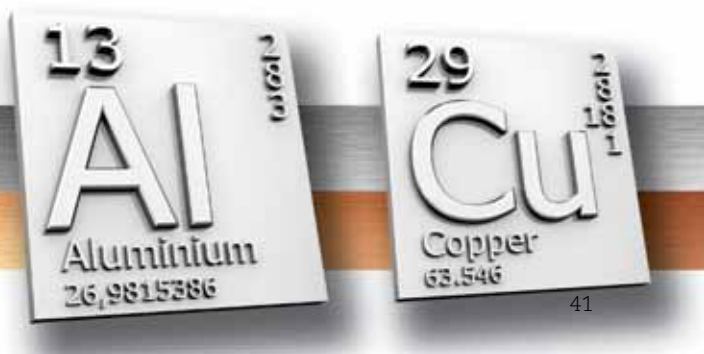
An example using a 35 mm² 3 core steel wire armoured cable gives the following:

Copper conductors

Current rating in air = **135 Amps**.
Impedance = 0.6270 Ω/kM.
Cable diameter = 30.5 mm.
Cable mass = 2.08 kg/m.
Bending radius = 305mm

Aluminium conductors

Current rating in air = **93 Amps**.



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Impedance = 1.043 Ω/kM.
Cable diameter = 27 mm.
Cable mass = 1.4 kg/m.
Bending radius = 270mm
From the above it can be seen that, size for size, aluminium cable is smaller and lighter than copper except for the current rating which is very much lower. This means that a larger cable size must be selected if aluminium is to be used.

Sizing of a cable is achieved through a process of selection based on certain base criteria.

The following factors are to be considered:

- The size of the drive in kW.
- Starting current multiples.
- Power factor of the motor (generally taken at 75% of full load).
- Type of starter (Direct On Line/Variable Speed/Soft Start etc).
- Derating factors for altitude, ambient, multiple cables on racks, solar radiation.
- Length of cable from the power source (DB/MCC) to the equipment (Control Panel/Motor).
- Type of cable insulation.
- Fault level of the system.

For the purpose of this report only balanced three phase electric motor drives fed from a central motor control centre are considered. Lighting and small power are excluded. Cable derating is ignored and only direct on-line starting is assumed.
System fault level is ignored.
For example:

- Motor: 90 kW.
- Line Voltage: 550 Volts 50 Hz
- Full Load Current (FLC): 120,81 Amps.
- Power Factor of motor at 75 percent of full load: 0,84 Lagging.
- Starting factor: 7,6 times FLC.
- Cable insulation: PVC/SWA/PVC.
- Volt drop under running conditions not to exceed 5% of nominal voltage.
- Volt drop under starting conditions not to exceed 15% of nominal voltage.
- Current rating of 35 mm² 3 core pvc/swa/pvc copper cable is 135 Amps in air.
- Current rating of 35 mm² 3 core pvc/swa/pvc aluminium cable is 93 Amps in air.
- Current rating of 50 mm² 3 core pvc/swa/pvc aluminium cable is 110 Amps in air.
- Current rating of 70 mm² 3 core pvc/swa/pvc aluminium cable is 145 Amps in air.
- A 70 mm² aluminium cable would be the smallest allowed.

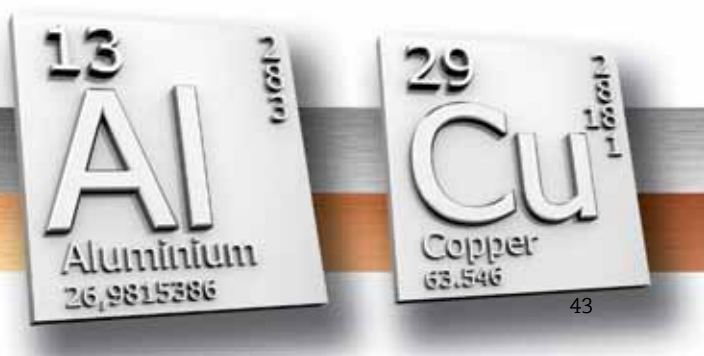
1. Data calculated with a cable length of 100 metres:
   Cable size using copper conductors: 35 mm², 3 core PVC/SWA/PVC/PVC/Cu.
   Volt drop under running conditions: 2.15%.
   Volt drop under starting conditions: 7.42%.
   Result: Cable suitable.
2. Data calculated with a cable length of 100 metres:
   Cable size using aluminium conductors: 70 mm², 3 core PVC/SWA/PVC/PVC/Al.
   Volt drop under running conditions: 2.37%.
   Volt drop under starting conditions: 5.14%.
   Result: Cable suitable.
3. Data calculated with a cable length of 200 metres:
   Cable size using copper conductors: 35 mm², 3 core PVC/SWA/PVC/PVC/Cu.
   Volt drop under running conditions: 4.30%.
   Volt drop under starting conditions: 14.85%.
   Result: Cable suitable.
4. Data calculated with a cable length of 200 metres:
   Cable size using aluminium conductors: 70 mm², 3 core PVC/SWA/PVC/PVC/Al.
   Volt drop under running conditions: 2.74%.
   Volt drop under starting conditions: 10.28%.
   Result: Cable suitable.

From the above it can be seen that by using aluminium cable the selected cable will be two sizes larger.

Using our example if a copper cable is used, a 35mm² is suitable whereas using aluminium cable, a 70mm² is required.

When terminating copper conductors, tin-plated copper lugs are crimped onto the conductor with a hexagonal crimping tool. This results in a solid copper to copper joint that can be bolted onto the terminating copper connection.

When terminating aluminium conductors, a different approach is required. The lug must be a special Al-Cu type such that the aluminium cable core is crimped into the aluminium tube which is bonded to the (bi- metallic) copper spade. This can now be safely connected to the copper connection. The crimping tool for this type of lug is not hexagonal but a circular deep indent, two of which are required. This indent pierces through the outer layer of aluminium, thus passing through the aluminium oxide layer of the outer skin. This applies to solid aluminium conductors.



Eskom

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Now is your chance to show off your creative talent and help save electricity in the Eskom Energy Efficient Lighting Design Competition 2010. With the energy challenges facing this country, there is increased demand for energy-efficient light sources in homes.

SAVE AND WIN

Put on your creative cap and design a lampshade that can accommodate an energy-efficient globe, or submit an innovative energy efficient design, system or product. The idea is ultimately to turn a brilliant design into one that finds its way into our homes.

Your design should be visually and aesthetically pleasing, and environmentally friendly. It should also be functional, practical and user-friendly.

The closing date for entries is 30 July 2010 and you can participate in the student or professional category.

PRIZES

Category A: Students (individual)

First prize: R30 000
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Third prize: R10 000
Prize for the winner's educational institution: R10 000
Ten most promising previously disadvantaged designers: R1 000 each

Category B: Professional

Innovative energy efficient lighting design: R30 000

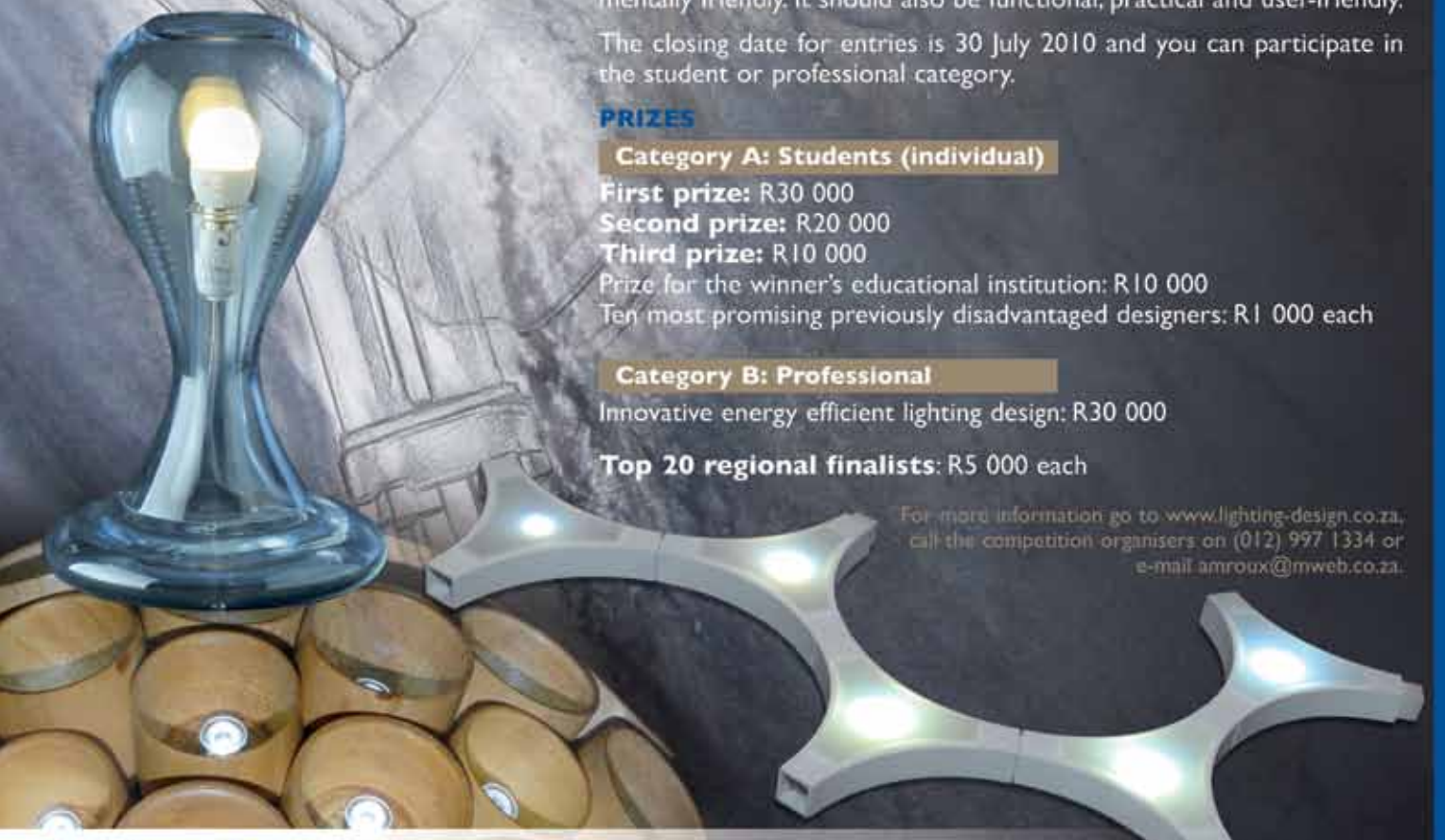
Top 20 regional finalists: R5 000 each

For more information go to www.lighting-design.co.za, call the competition organisers on (012) 997 1334 or e-mail amroux@mweb.co.za.

Energy-saving tips

Adopt these energy-wise habits:

- Turn off the geyser if you're going away for longer than 48 hours.
- Switch off the television, computer, and similar appliances when you're not using them.
- Replace regular light bulbs with energy-saving ones – they use a quarter of the electricity and last six to eight times longer.



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A hexagonal crimp can be used provided that certain precautionary steps are taken. The outer skin of aluminium cores develop an aluminium oxide layer that reduces electrical conductivity. To allow the use of hexagonal crimping this layer must be completely removed and the surface 'roughed up' immediately prior to crimping. For this reason hexagonal crimping of solid conductors is not recommended.

Figure 2: AI indent crimping sequence.

If an aluminium conductor is crimped into a copper lug, two things happen:

1. An electrolytic reaction takes place when moisture is introduced causing corrosion.
2. The temperature co-efficient between aluminium and copper is such that when heated, under load, the two metals expand and contract at a different rate. (17X10E-6 for copper & 23X101E-6 for aluminium). This causes looseness within the crimp with the subsequent overheating and finally failure. This can also be the cause of fires.

There is a large difference between the size of copper and bi-metallic lugs. Using our example, a standard 35 mm² copper lug is 37 mm long whereas a 70 mm² bi-metallic lug is 86 mm long.

Thus it can be seen that, in most instances, more space is required for terminations. This can result in the terminating box being too small, requiring the addition of a larger box. In many instances this is not physically possible so an additional inter-connection box needs to be introduced where the aluminium cable is terminated onto short bars and the smaller copper cable connecting to the motor. It would be preferable to install local isolators where this aluminium/copper transition can take place.

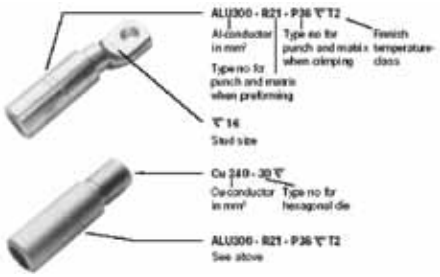


Figure 3: Example of marking on AI- and AICu-terminals.

Both copper and aluminium cable have the same delivery periods although aluminium, as it is not as popular, cannot readily be sourced in a hurry. It is manufactured on demand whereas copper cable is kept in stock.

The order quantities are the same as are the drum lengths.

Copper lugs are manufactured in SA so are readily available.

Bi-metallic lugs are imported but the local stockist carries a fairly large consignment. Availability in remote locations could be a real problem.

Aluminium cable is prone to cracking and failure when subjected to vibration. In nearly all electrical installations vibration is present. Motors and transformers produce vibration so the use of aluminium cable will be more susceptible to cracking than copper.

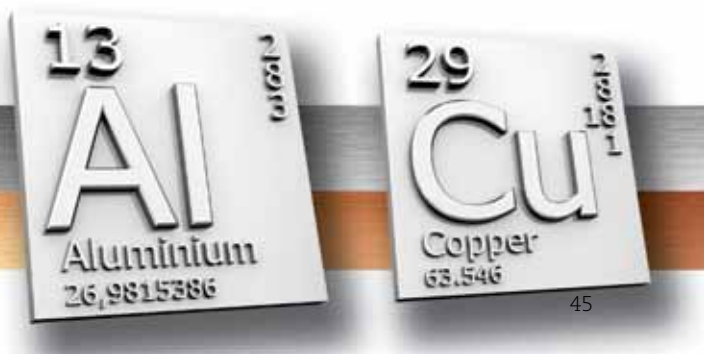
There are recorded cases of aluminium overhead lines failing due to Aeolian vibration.

Vibration damage is even more serious in solid aluminium conductors.

Aluminium has excellent corrosion resistance but this is only true for aircraft grade aluminium and coated aluminium as used in window frames etc. Aluminium used for cables corrodes when installed in damp conditions so is not really suitable for damp process plants and is not recommended.

Contrary to the above, aluminium cables have been used successfully on the Mozal and Hillside aluminium smelters, both at high humidity coastal locations, where no reports of vibration cracking or corrosion have been experienced. The only failures experienced are where inadequate measures were taken in the selection of lugs or masking with corrosion inhibiting Denso putty or tape.

All motors were fitted with local isolators where the transition from aluminium to copper cable took place and no vibration was transmitted to the aluminium cable from the motor. The 360,000 amp DC open aluminium bus bar system displayed no symptoms of corrosion and no special precautions were taken to protect it from the elements.



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Features

- Continuous monitoring of earth bond integrity.
- Connects to 400/525V 3-phase system.
- For safety the maximum energy available at the local earth is 380/525V limited to 0.3 Joule / pulse.
- Three different trip times and levels available for discrimination.
- Able to withstand failure of one phase or 50% supply voltage.
- LED indication for trip condition, also when power is off.
- Totally solid state, shock-proof: no moving parts.

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JOJEN SUPPLIES

Figure 4: 360,000 Amp DC positive aluminium Busbar installation.

The qualification of the installation electrician is the same for both copper and aluminium. Aluminium is more difficult to work with so the cost of termination is higher. On average the additional cost is in the region of 12 to 15 % of the cost of termination. The actual installation of the cable onto racks costs the same. Aluminium cable is smaller and lighter than copper but due to the increase in size a slightly larger ladder support may be required in some instances.

If, as in our example, there were 10 drives following the same route, then the size of ladder required for copper cables would be 305 mm wide whereas for aluminium cable would be 330 mm wide. A 400 mm wide rack would be chosen.

The mass of copper cable on that rack would be 21 kg/metre whereas the aluminium would be 20 kg/metre, thus not much different.

Aluminium cables are cheaper than copper. Using our example we get the following:

35mm² 3 core pvc/pvc/swa/pvc/cu cable R 140.36 per metre (2007)

70mm² 3 core pvc/pvc/swa/pvc/al cable R 98.55 per metre (2007)

Thus for an installed length of 200 metres:

1. Using 35mm² Copper cable costs R 28 072-00.
2. Using 70mm² Aluminium cable costs R 19 710-00.

This shows a significant saving but the additional cost of lugs and labour must be added. A hidden cost is the requirement of larger enclosures/terminal boxes that is rather difficult to quantify.

1. Cost of 35mm² copper lugs R 10.75 Ea X 6 = R 64.50.
2. Cost of 70mm² bi metallic lugs R 68.35 Ea X 6= R 410.00.

The termination labour cost of 35mm² copper 3 core cable is R 151.67, thus terminating both ends is R303.34.

Termination labour of a 70mm² aluminium 3 core cable is R 225.72, thus terminating both ends is R 451.4.

Total installed cost for copper cable is R 28 166.84.

Total installed cost for aluminium cable is R 20 571.40.

Saving by using aluminium cable is R 7595.44 per drive of 90 kW. (±27%)

The use of aluminium cable is significantly cheaper than copper so when used on a project, the cable costs will be considerably less and, depending on the amount of large cables involved, could present considerable cost savings. The cost of lugs is, conversely, much greater than copper.

Added to this is the additional cost of labour as aluminium cable is more difficult to work with. The cost of tooling is also higher but, obviously, not to the same extent.

The biggest drawback to the use of aluminium cables is the risk factor.

Once an aluminium cable has been installed it cannot safely be moved. Further, when handling aluminium cable great care must be exercised to ensure that it is not bent too many times as this leads to cracking.

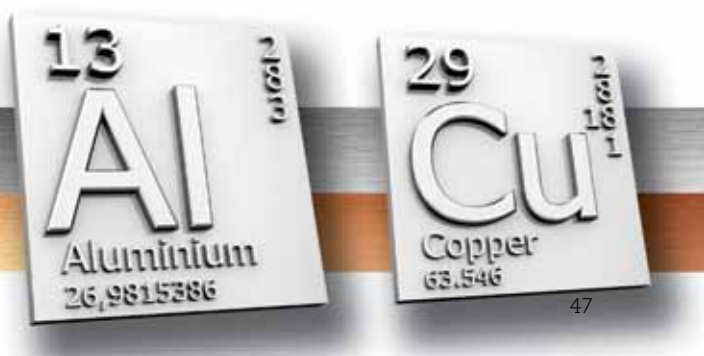
The bending radius of aluminium cable is smaller than that of copper but, once bent, it cannot safely be straightened.

Great care must be taken in applying moisture-inhibiting putty or grease on all joints to prevent electrolytic reaction. Corrosion can be a serious risk factor in damp conditions.

Providing that the associated risk is acceptable and the correct installation methods are strictly applied then the use of aluminium cable can result in approximately 27% savings for the supply and installation of cables.

All cables of 25mm² and greater from the cable schedule were used to evaluate the possible savings by using aluminium cable in place of copper. The following costs were extrapolated using the estimated saving percentage from this report.

LV cables	
Cost of Cu cables greater than 16mm²	R 5,203,735
27% saving on above	R 1,405,008
Additional cost for Junction Boxes at motors	R 425,000
Additional cost of cable from Junction Box to motor	R 169,556
Mounting of Junction Boxes	R 34,000
Cable cost savings	R 776,452
HV cables	
Cost of cable	R 1,492,815
Estimated 18% savings	R 268,706
Total savings for the use of Al cable	**R 1,045,158**



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Engineering the future

SAIEE Presidential Address by Dr Angus Hay FSAIEE

There's never been a better time to be an electrical engineer in South Africa. This is not an uncommon view; in fact, the sentiment has been repeated quite a few times in The First Ten Decades of this Institute, judging from Mike Crouch's book of the same name. Engineers, technologists and technicians created our modern world; our various electrical varieties – power, control, electronics, telecoms, and software, amongst others – are responsible for much of the innovation of the past century. Our passion for making things electrical work will ensure that we continue to play this role in society, at least for the foreseeable future.

How, you may ask, can I say this when we are not yet out of the grip of a global financial crisis, and expecting only a slow economic recovery? The near collapse of financial systems points to a deeper problem in the economy of the world – a world where financial engineering has become more important than real engineering, and money an increasingly unreal commodity, disconnected from real value.

In their book The Puritan Gift, Kenneth and William Hopper argue that this is not how the industrial economy was built. It was not built by business school graduates, managing companies from the top down, directing all efforts towards maximising the share price. Rather, it was built from the bottom up, mainly by engineers. Many of the great industrial companies of the 20th Century were led by engineers, often supported by teams who had worked their way up through the line, with an intimate knowledge of what the companies really did. Lucy Kellaway, writing in The Economist's The World in 2010, is even more scathing: "The myth of the MBA has for some time left the facts behind."

If one is looking for modern examples of the good old-fashioned engineering approach to economic development, one needs to look to the east. When President Hu of China appointed his first cabinet in 2002, every one of them was an engineer. Perhaps this, in part, explains China's ongoing extraordinary economic growth and industrialisation.

There's little doubt that the world's great industrial nations are the product of competitive free markets – something China has certainly realised in recent years. Yet through the global financial crisis, some have been quick to point to capitalism itself as the flaw in the world economy. The real flaw, of course, is in our understanding. According to Adam Smith, the 19th Century father of capitalism, "Consumption is the sole end and purpose of production; and the interest of the producer ought to be attended to only so far as it may be necessary for promoting that of the consumer..."

In reality, the success of great industrial economies has been the result of people working collectively within organisations towards common goals – precisely the kind of teamwork that we see in successful engineering teams. Herein lies the lesson for South Africa's economy, and for us as South African engineers.

There's little that business schools, management consultants, or even politicians can do, if we don't have the engineers, technologists and technicians that build the real value in the economy. We need to do everything we can, not just to nurture engineering talent, but also to build organisations that will maximise the value of engineering teams. By regarding engineering merely as an implementation arm for short-term financial strategies, we lose the long-term value that true engineering leadership can build. In a speech to this Institute last year, the Minister in the President's Office, Trevor Manuel, said, "Hopefully, one of the positive implications of the fall from grace of the financial sector is that fewer people would want to become investment bankers, and more would take up engineering."

He's in good company. US President Barack Obama, a lawyer by training, wrote in the preface to his book The Audacity of Hope: "I wish this country had fewer lawyers and more engineers". I agree – and this country too.

By its very nature, engineering displays optimism about the future. Engineers believe that any problem can be solved, given enough of the right resources, and that they can always improve the world through their innovation. It's this attitude that we need to pass on to our children, and to the next generation of potential engineers.

In South Africa today, we face a greater challenge. The vast majority of young people have not had the benefit of a parent who is an engineer, or even with a background in the sciences. Without the direction I received from a young age from my electrical engineering father, who was a Fellow of this Institute, perhaps I too would not be here today. In his book Outliers, Malcolm Gladwell shows that there's a high correlation between growing up in a home that values learning and self-reliance, and later success. He goes on to make the point that "...no-one – not rock stars, not professional athletes, not software billionaires, not even geniuses – ever makes it alone".

Clem Sunter, speaking at our recent Centenary Conference, said that, "good education is the number one indicator of a winning nation". Certainly, we need to put much effort into our education system to build the literacy and numeracy that is essential to make engineers. However, as an Institute, we also need to find ways of sharing the spark of electrical engineering as well, to create that passion for solving problems and making things work that will lead young people into engineering. Some of the problems that need to be solved by engineers are not simple; take climate change for example. At last, the world is starting to take the environment seriously, as evidenced by the presence of many of the world's leaders in Copenhagen in December last year. To the man in the street, engineers are to blame for climate change. Yet it is only through engineering, and particularly through electrical engineering, that we are going to meet these challenges, and build a sustainable future.

During this year, 2010, South Africa is going to be on show to the world, through the FIFA World Cup™. As a country, we certainly celebrate our diversity, yet we seem all too often not to see our own strengths. The electrical engineering fraternity – the members of this Institute – represent one such oft-overlooked strength. Much as we'd like our footballers to be our heroes, it is you, the engineers of South Africa that are our true heroes in 2010.

You, the electrical engineers of South Africa, are going to ensure

Engineering the future...continued

economic recovery and growth; you are going to build the infrastructure and systems that millions will rely on in future; you will make our technologies environmentally sustainable; and you will need to pass on your passion for electrical engineering to the next generation.

Speaking as President of this Institute in 1915, Bernard Price observed that ours "... is a young country possessing almost infinite possibilities and we as electrical engineers know the important part which electricity has to play in the development of those possibilities." But for a century of technological advances, he could have been speaking today – South Africa remains alive with these possibilities.

This year, with a century of electrical engineering behind us, we will also engineer the future of the SAIEE. We aim to improve the services to our members, using the better electronic tools of communication now at our disposal, and to improve and grow our publications, making use of the SAIEE Publications company; we will continue to contribute to public policy on electrical engineering and technology and to professional engineering development; we will continue the transformation of the Institute, made obvious through the changing composition of our Council in 2010; we will commence the building of a new home for our growing Institute; we intend to make electrical engineering more visible to society as a whole, and aim to expand on our current educational and outreach initiatives. Most importantly, we aim to ensure that we are seen to take pride in electrical engineering, to attract more and better electrical engineers to the profession and to the Institute.

In keeping with this year's theme of "Engineering the Future", this talk would not be complete without some mention of the technologies of the future that we are going to engineer.

The conjunction of new battery and fuel cell technologies with the threat of peak oil has brought us to the brink of a new age of electric vehicles – and there is at least one high-profile South African project in this field. Alongside this, we see other rapid developments in green engineering, such as solar and wind electricity generation, and a trend toward electrically driven high-speed rail in place of air travel and cars. Nuclear power will over time replace oil- and coal-fired power stations; and where we still use coal, dramatically reduced carbon emissions will become the norm.

The efficiency of our power distribution will improve too, as the smart grid becomes standard electrical engineering practice. Achieving greater energy efficiency will not be confined to heavy current electrical engineering – in the light current field, energy efficient networking and IT systems will be needed in order to reduce the load that the Internet places on the planet today.

Even pure science wouldn't get far today without electrical engineering. From Europe's Large Hadron Collider consuming as much electricity as a small city, to the proposed Square Kilometre Array radio telescope requiring 1 Tbps of optical fibre bandwidth, to the satellites (including South Africa's own recently launched SumbandilaSat) that circle the earth telling us everything from the weather forecast to where we are – all require electrical engineers.

Medical science today relies on an array of electrical and electronic machines, employing everything from superconducting magnets in MRI machines, to thermal imaging to detect swine flu at airports. Biomedical engineering is already offered as a variant of electrical engineering at our universities, and the field is likely to become increasingly important.

In telecommunications, the Internet has come to dominate our thinking in recent years. There seems no end to the growth of bandwidth, as optical fibre networks steadily replace copper wire, from submarine cables that span the globe, to the last mile that was always the bottleneck to broadband. 4G wireless networks will soon be delivering 100 Mbps to a handset. The Internet itself is getting smarter, evolving from a simple bearer of information, to a medium for efficiently delivering every conceivable form of digital content, from simple text, to voice, to images, to high definition streamed video over global content delivery networks.

As this content reaches our offices, homes and hands, it meets a bewildering array of consumer electronics, which is also evolving faster than ever. High-Definition is already here, and stereoscopic 3D television is finally becoming a commercial reality. Broadcasting is evolving into on-demand narrowcasting – yet another subset of the Internet. Already, we all carry around Star Trek style communicators in the form of smart phones, and no doubt we'll soon have iPads like theirs too. Today's flat screens will be made obsolete by Organic LEDs, and Blu-Ray may give way to online streaming video.

As futuristic as they sound, many of these advances are expected to happen in 2010, such is the pace of development in our field. Yet what about ten years from now – our 2020 vision for electrical engineering? The IET recently published the views of several futurologists, whose predictions read a bit like science fiction. They predict a shift to more natural human-machine interfaces, pervasive networked computing, the rise of augmented reality, holographic communication, driverless electric vehicles, biomedical engineering advances, and perhaps artificial intelligence overtaking human intelligence. All of these advances are going to be the product of electrical engineering of one or other sort, and all are going to require electricity, perhaps even generated in each home, using renewable sources... though we should not forget that by 2020, some of the new power stations currently being built in South Africa will only just be coming on stream.

Yet perhaps the greatest challenge for electrical engineers in South Africa will be to ensure that these advances make a difference in the lives of ordinary people, just as the electrification programme and cell phones have over the past few years.

Looking further into the future than ten years is challenging. According to the physicist Neils Bohr, "Prediction is very difficult, especially about the future". However, as electrical engineers, we should rather follow the advice of the renowned computer scientist Alan Kay, who said, "The best way to predict the future is to invent it."

The long-term future of electrical engineering is today's science fiction – space elevators, levitating vehicles, cybernetics, holographic virtual reality, nanotechnology, and artificial intelligence. It's anybody's guess what the future might look like 100 years from now, but we can be certain of one thing: electrical engineering, or perhaps its descendents, will form an important part of that future.

There's never been a better time to be an electrical engineer.

SAIEE workshop on load shedding

By du Toit Grobler

The SAIEE hosted an important workshop in the Telescope Auditorium at Observatory at Innes House in May and the theme of the workshop was the newly published Code Of Practice For Managing Load Reductions During Power Systems Emergencies Nrs 048 Part 9 2010.

The workshop was facilitated by the working group that was responsible for the Code of Practice, which provides guidelines for load shedding, restoration and critical and essential load requirements under system emergencies.

The Code of Practice has been developed by a team comprising members of the electricity supply industry, consumers, the National Electricity Regulator of South Africa and the government. The full Code of Practice is available on the South African Bureau of Standards' website.

The workshop informed attendees on the current requirements of this Code of Practice (NRS 048-9 Edition 1) as well as on the issues that are currently under deliberation for the second edition of this document.

Attendees were informed on the various options available to customers to mitigate the impact of load shedding, should this become necessary under a system emergency.

While the likelihood of load shedding increases under system constraints (both national generation constraints and local system constraints), this Code of Practice has been designed to enhance the resilience of the country in the long term.

This is particularly important as national or regional system emergencies that require load reduction could still occur even when the generation reserve margin is healthy.

The chairman of the working group, Tony Dold, who works for the eThekwini Municipality, managed the proceedings of the day and the Immediate Past President SAIEE, du Toit Grobler, welcomed the delegates and presenters to the Workshop.

Topics covered during the workshop included:

Tony Dold provided an introduction to the workshop and background to the development of NRS 048-9 and the working group while a brief history of load shedding in SA, along with an overview on current initiatives to manage supply and demand, was provided by Theresa Carolin of Eskom;

Robert Koch, also from Eskom, outlined the principles of load reduction and restoration procedures while D Marais of Umhlathuze Electricity provided implementation case studies. This was followed by a further presentation by Robert Koch on critical and essential load requirements and the future of emergency load shedding.

Delegates took active part in discussions of the various topics. The implementation of initiatives identified during the 2008 load shedding experience that could alleviate future load shedding experiences was questioned.

du Toit Grobler shared the experience of his household when taking part in the Eskom Load Shedding Pilot Project which was run in the Lonehill area recently. Every participating household was given an intelligent "Edi" load monitoring device which plugs into any 15 Amp socket outlet.

Edi displayed the instantaneous load drawn by a household. During the pilot project a load limit was given to consumers who then had ten minutes in which to reduce load or to be shedded from the system for two hours.

In order to get participants on board, remotely switchable disconnects had to be installed to individual consumer feeders. The outcome of the pilot project has not been made public.

What made the project awkward and less valuable was the fact that pilot runs were carried out during the day when most family members were at work and the load control was left to domestic workers who had no training in managing loads.

On numerous occasions family members arrived home to face by flashing alarm clocks, a sure sign of load shedding earlier that day. Also, a dedicated Eskom helpline would have enhanced the success of the project.

About 46 delegates, presenters and working group members attended this most successful workshop. The SAIEE is busy considering rolling the workshop out to the KwaZulu-Natal and possibly other centres of the SAIEE.

More than 50 percent of the delegates are registered both as members of the SAIEE and professionals with ECSA. This confirms the appropriateness of holding such a workshop. The workshop was validated for the purpose of gaining CPD points for attendance and for presenting at the workshop.

Obituary Ron Wedderburn By Alec Duff

On completion of his studies, Ron Wedderburn joined Eskom and became a protection specialist, where his knowledge and experience in the soon earned him the reputation as an expert in these matters.

Ron's and my paths crossed in the late 1970s when he had left Eskom and joined GEC Measurements – his reputation as a protection specialist was further enhanced while at GEC.

On leaving GEC, he worked on his own for a while, and then joined HKS (now Gibb Africa) as an electrical consultant.

It was from here onwards that I had dealings with him on many projects. At times he could be quite a difficult customer, and was very demanding in his requirements.

We will all recall when Ron had a rather serious electrical accident about 20 years ago, in which he received bad electrical burns to his legs, arms, face and hands while performing an inspection at an electrical sub station. Visiting him in hospital after this event helped forge a friendship that I will always appreciate and never forget.

Soon after this Ron retired and chose to continue working from home on projects of his choice, which included Iscor Empangeni, Komati Sugar Mill, and Kumba Resources.

These projects were green field projects, and Ron was responsible for the 11 kV switchgear and protection design at both Iscor and Komati.

Ron was registered as a Professional Engineer and a Professional Engineering Technologist with ECSA, and served on many committees such as ECSA (candidate review), SAIEE Power section, SAIEE Council. In addition he provided valuable input into the Electrical protection aspects of NRS specs.

Of course, he brought his sense of humour to these meetings and ensured that nobody dozed off. His knowledge regarding protection relays, transformers and switchgear was respected by all.

Ron always found the time to assist people with less knowledge and experience in his field. Speaking of fields - one day Ron phoned me and asked me to calculate a specific fault current – I replied that he could do it himself, and he answered that he was on his tractor cutting the grass!

He was a man respected by many in his personal capacity and as a professional engineer.

One of Ron's strong points was teaching. He delighted in giving protection classes around the country. This was his way of giving back to the industry and helping to promote an understanding of the philosophy of protection.

Another strong point was his deep religious conviction and, with that, his willingness to assist his fellow man in whatever circumstances they found themselves.

On a lighter note, Ron had a tremendous sense of humour, and would always try to catch you out. Those who were phoned by Ron usually had difficulty establishing just who was calling. His opening line was usually something like "Hey man, it's Moodley here from Durban Metro Police, and we are informing you that you have outstanding fines in Durban and must pay them now."

Sometimes they were more formal, like, "Good afternoon Rev ???? this is the Bishop calling."

How we shall miss him.

His chatting up the ladies, even when in hospital, was something to experience. Ron enjoyed a good bottle of red wine and would delight in telling stories of the old days. We spent many an afternoon braaiing with John, Winston, Ron and me – these are good memories.

His farm, with his tractors, wild flowers and trout dam, became his pride and joy in his retirement years, and he willingly led friends on guided tours.

The highlight of Ron's later life was Rikki, his partner of 10 years. When this lovely lady came into his life, she provided companionship and a home. She cared about him and, in turn, he cared very deeply about her.

I think I speak on behalf of us all when I share the joy that we all felt when they got married, only weeks before his death.

As time goes by and details begin to fade – one memory will always remain, that of an imposing man, dressed in his kilt, laughing and talking, and enjoying life–Rest in peace, my friend.

Obituary Clive Errol Burchell

Clive Errol Burchell was born on the 3 August 1933 in Boksburg and passed away on 4 April 2010. He went to school in Boksburg, qualified as an electrician and furthered his studies to become an electrical engineer. He worked for a number of companies including Switchgear and Erection, South Wales Electric, Johnson and Phillips which became GEC, and for whom he worked for 29 years and was the manager of their transformer division. He then joined ASEA, which became ABB Technologies. He retired at 65 but was requested to remain with ABB Technologies until he was 69.

He was a member of the Affiliates Committee of the Association of Municipal Electrical Undertakings and was elected an Honorary member of the Affiliates Committee. He was one of four persons afforded this honour in 90 years. He was also a member of Cigre, the International Council on High Voltage Systems and served on the Executive of the South African National Committee of Cigre for many years.

One of Clive's honourable qualities was his lifelong commitment to serving his fellow man. He was a member of Round Table for 13 years, 11 of which were as an executive. He was also a member of Rotary for 29 years and was awarded the Paul Harris Fellowship Award, which is one of the highest awards that can be bestowed by Rotary.

Clive is survived by his wife of 50 years, Elise, and two sons, Peter and Paul. He will be remembered for his work ethic, loyalty and honesty and will be sorely missed by all his friends and colleagues in the South African electrical industry. The SAIEE pays tribute to the loyal and faithful service given by Clive to the very wide spectrum of colleagues and the electrical engineering fraternity. His friendliness and consistency in demeanour will be sadly missed.

H.O. Broschk, FSAIEE

TELECOMMUNICATIONS RESEARCH GROUP

POWER LINE COMMUNICATIONS:
University of Johannesburg

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Coding Techniques
Information Theory
Video Communications
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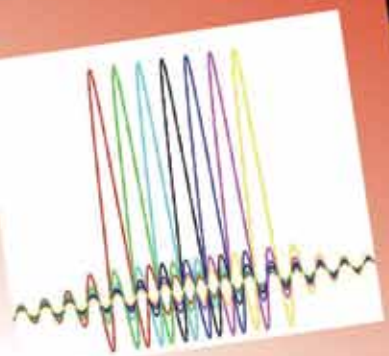

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