WATTnow

Be Enlightened

Africa – a dark continent that will remain in darkness

Pope says Facebook's fine

Wind farms – figures are wrong

Lies, damned lies and statistics...

Official Magazine of

SAIEE

January 2011















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Africa's darkness is an engineering challenge

There is absolutely no way in the world that Africa will be able to afford to efficiently, quickly and rapidly create an electricity generation, distribution and transmission service to span the continent. At least not in my lifetime and probably not in yours either.

So the notion of providing universal access to electricity for every resident on the continent is nothing more than a fantasy. Or is it?

You see the fascinating thing is that while many people think that the only real energy solution lies in creating massive grids, huge power stations and enormously complicated distribution services, they might be wrong. There might be other ways of tackling the problem. And this is where the electrical engineers of this world could play a role because it is exactly the kind of challenge they respond to.

What I find particularly interesting about the African electricity picture at this point is not how little electricity is available to the people but rather how huge the opportunities are for those people who can provide a solution.

And countries like Ghana are showing some signs of the way that these solutions might develop: it has embarked on small-scale photovoltaic solutions so individual households can have solar systems that provide enough energy for lights, cellphone chargers, a few appliances and so forth.

In Kenya, similar systems are being developed and deployed while in Tanzania mini-hydroelectric power stations are being erected to provide power to a town or a village.

Projects like the Inga hydroelectric power stations get bogged down, not purely because of the bureaucracy but because the distribution infrastructure does not exist and has to be built from scratch at a cost of billions of dollars. And Africa doesn't have billions of dollars and, in many cases, doesn't have the necessary collateral to raise the money either.

So, while there are some impressively big projects underway (in places like Egypt and Angola) the reality for me is that the smaller projects, geared to communities, towns, villages or individual homes are likely to provide some of the real solutions to removing that veil of darkness that hangs across the continent. There is no doubt that Africa – more than any other region in the world – has a desperate need for stable electricity supplies and that the development of the continent as a whole is being stymied by a lack of electricity.

But I seriously don't believe that this continent will get mass electrification projects akin to those that have been deployed in Europe, Asia and North America. At least not for a very long time.

With that in mind, it means that Africa becomes an ideal testing-bed for new energy initiatives and it is the world's engineering community that can come up with the solutions that would help to resolve the difficulties that face this continent.

Let's face it, the electricity infrastructure of developed countries has taken about 100 years to perfect and Africa doesn't have 100 years to develop its own electricity solutions. The financial, agricultural and economic pressure on the continent is just too great.

Africa needs a quick-fix and the only form that can take is to look for small, easily-deployed, and readily implemented methods of providing electricity that are stable, safe and affordable.

I don't profess to have the answers – after all I'm not an engineer – but I do see that there are 750-million people who desperately need energy and that represents a huge opportunity for the companies or individuals who can solve the problem of providing it.

And what we need is an engineering solution because, with the right engineering in place, the business models and the funding will follow.

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Design & Layout
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Published monthly by
Crown Publications cc
2 Theunis Street
Bedford Gardens
Johannesburg
Tel: (011) 622-4770
Fax: (011) 615-6108
e-mail: crownmag@crown.co.za

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Circulation and Subscriptions:
Norma Massey
normam@crown.co.za
R240 (incl. Vat) per annum
Postage extra outside RSA

CROWN PUBLICATIONS

All enquiries for WattNow:
P O Box 140
Bedfordview, 2008

All enquiries for SAIEE:
P O Box 751253
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SAIEE
South African Institute of Electrical Engineers

SAIEE 2010 Office Bearers
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ISSN: 1991-0452

Printed by: Shumani Printers, Cape Town

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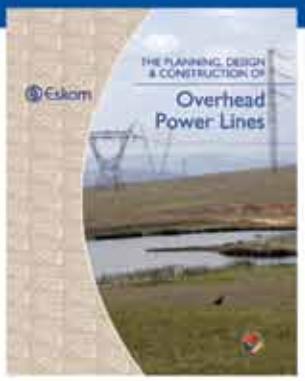
ABC Certified
Total Paid Circulation 25, Total Free 3770, Total Circulation 3795
July - September 2010



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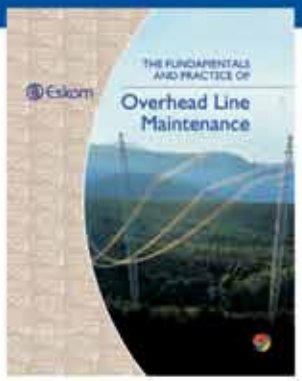

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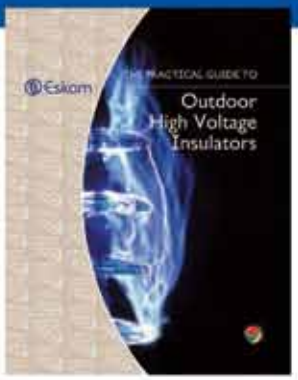

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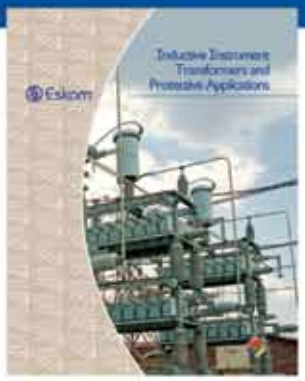

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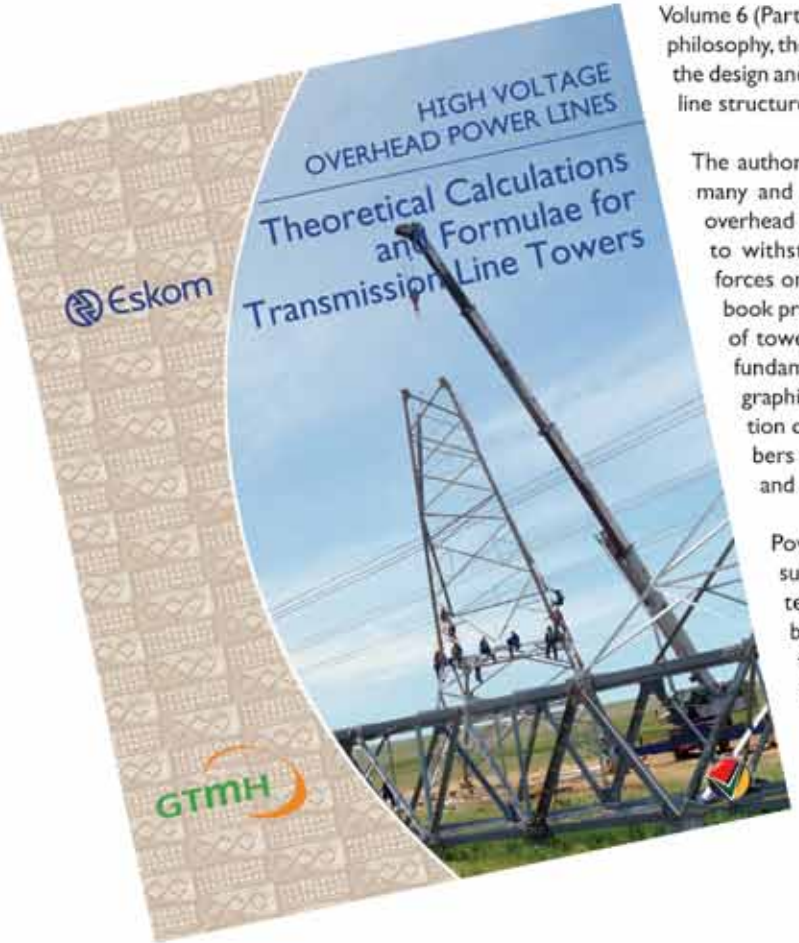

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The author begins with an analysis of the many and varied mechanical forces that overhead power line towers are required to withstand. Once the nature of the forces on the towers is understood, the book proceeds to discuss the geometry of towers. It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

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

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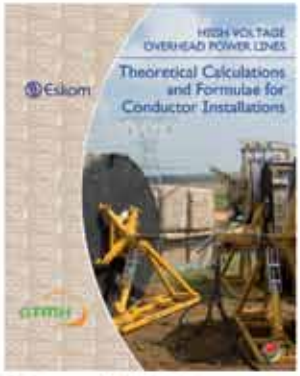

Volume 6: High Voltage Overhead Power Lines: Theoretical Calculations and Formulae of Conductor Installations

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Eskom Holdings Limited Reg No 2002/015527/06 May 2010

Apps for Development

By Gavin Chait

On Friday 14 January, after 23 years of absolute power, Ben Ali fled Tunisia for Saudi Arabia. What had started as one person's desperate protest at having his livelihood taken away became a mass rebellion that propelled a dictator from power.

Such protests don't have much to do with technology. As much as pundits like to say that Facebook or Twitter promote democracy, they probably don't. Wikileaks may have made some impression as the secret dispatches from the US embassy indicated that the support from the US government wasn't unequivocal. Anonymous, a bunch of hackers and youngsters who enjoy online pranks and denial-of-service attacks, lent their weight to the general mayhem by attacking Tunisian state websites. This is still world's away from standing before the soldiers and being shot at.

None of this has stopped the general and wide-spread belief that technology can do much to bring about social change and end absolute poverty. The capacity for technology to drive change is limited by two things: the will of the people who use that technology to demand change; and whether governments are willing to murder their own citizens in order to prevent change.

The capacity for mobile phones to disrupt entrenched market relationships is also in doubt. One of the most quoted stories is how fishermen use their mobile phones to find the best markets for their catch. "I hate hearing my research quoted incorrectly back to me," says Dr Reuben Abraham of the Indian School of Business. What his research actually showed was that, while such information helps the wholesalers and distributers it doesn't help the fishermen. "Most of the poorest fishermen will borrow money from a wholesaler in order to afford to go to sea. They'll pay that loan back with their catch and so can't go where they like."

Technology can only take you so far.

The search for technology's impact on market efficiency isn't limited to emerging economies. Numerous studies have struggled to find a hard link between increased technology and economic returns. Clearly, the explosion of information technology has created more wealth over the past two decades than at any time in history.

Watt's Going On?

But which bit, and what technology?

Developed countries have eagerly accepted advances in medical and telecommunications technology but have resisted advances in genetically modified foods, no matter the science that shows the benefits. Likewise, while proclaiming an interest in alternative energy, nations around the world continue to subsidise their coal and oil producers. The poorest nations keep foreigners out for all but the least politically-sensitive industries.

The conundrum can be summed up as follows: even in the most open of societies, incumbents have a tremendous advantage in preventing new competitors from undermining them. Those incumbents can be companies, the government, or even a majority of a nation's citizens.

Yet, plainly, technology must be making a difference. Life-expectancy in all but a few hardened hold-outs is up; infant mortality is down. Politics is less free, according to the annual Freedom of the World survey by Freedom House, a US advocacy group. Something must be making up the difference.

In Rwanda, Unicef claims to have cut the death rate amongst pregnant women and babies by 50% through a mobile phone application called Rapid SMS. "I think the mobile platform is incredibly important for the work of NGOs and development in general. It allows us to expand the reach of the programmes we have and create efficiencies within them," says Erica Kochi, co-lead at Unicef's New York-based Innovations Unit.

Joel Selianko, a former Wall Street software programmer, set up Datadyne with Red Cross IT expert, Rose Donna. Episurveyor runs over the web and can be accessed by mobile phones enabling public health data collection in poor countries. It allows disease outbreaks to be tracked and preventative care to be organised.

Considering that in Africa, one of the poorest regions on Earth, 70% of people have mobile phones, any software aimed at the platform can be tremendously enabling. It doesn't even have to be that sophisticated.

In Nigeria a mechanism for sending money to rural areas is simply to buy a prepaid airtime voucher and SMS it to family back home. They take the voucher number to local traders who will buy it from them to sell to others.

The most successful of such schemes is M-PESA in Kenya. The development was initially sponsored by the UK-based Department for International Development (DFID) in 2003 to 2007 before becoming a private company. The service now has 6 million customers and is run by IBM Global Services on behalf of Vodafone in Kenya, Tanzania and now Afghanistan.

Vodacom and Nedbank have announced the launch of a similar service in South Africa.

Microfinance schemes have certainly been one of the big beneficiaries of mobile technologies but a large number of projects are aimed at improving lives using technology. Muhammad Yunus, founder of Bangladesh-based Grameen Bank, has kicked off a Village Phone Project, where women borrowers take out a loan to buy a handset and a solar charger and then operate as their village pay phone. The service now reaches 200,000 women.

In October 2010 the World Bank launched their Apps for Development competition with a view to promoting the use of their new API to evaluate and serve the interests of the Millennium Development Goals.

From being deeply guarded about releasing their global health and econometric data, the World Bank has caught religion. "Much of the data collection that could improve public health research is expensive and time-consuming," says a recent announcement as they set out their initiatives to promote the release of health research data. Their API grants open access to almost 4,000 indicators for 240 countries going back to 1960.

60 applications were submitted by their 10 January 2011 deadline.

Other services, like Kiva which allows Americans and Europeans to divest some of their spare cash to microfinanciers in emerging markets, have also become popular.

Neither is such technology limited only to software and mobile phones.

Harvard researchers have developed paper chips which form a three-dimensional diagnostic device by layering them with punctured pieces of waterproof tape. A drop of liquid can move across channels and into wells on the first sheet, diffuse down through the holes in the tape, and react in test wells on the second paper layer. The ability to perform many more tests and even carry out two-step reactions with a single sample will enable the device to detect diseases, like malaria or HIV, that require more complicated assays, such as those that use antibodies.

These tests are still in early trial but offer tremendous promise.

LifeStraw, created by Vestergaard Frandsen, offers a low-cost point-of-use water treatment filter. Dean Kamen – inventor of the Segway – even got in on the water-act with his Slingshot distillation device.

Not all technology is developed by rich foreigners, either. Limitations are often the source of fertile and profitable new ideas.

C K Prahalad, author of "The Fortune at the Bottom of the Pyramid", declared that, "the essence of entrepreneurship is that aspirations overcome resource limitations." And aspirations drive innovations.

The aggregated wealth of the poor is $5 trillion, according to a study conducted on behalf of the World Bank. "Children are told, 'Eat your veggies, there are starving

people in Ethiopia!' and so they grow up associating poverty with starvation and impossible despair," says Prahalad. "It is very difficult to transform that type of thinking into ideals around investment; that the aggregated wealth of the poor is significant."

It is possible, though. Prahalad gives the example of the Aravind Eye Care Project in Madurai, India. Cataract surgery in the developed world costs around R15 – R25,000 depending on the nature of the intervention. A comparison between the Royal College of Ophthalmology and Aravind Hospital by the UK National Survey in 2001 declared that Aravind was superior on virtually every level. Aravind Eye Care charges between R375 and R2,000 per operation and they have been profitable since they started.

Much of this requires a significant change in the way in which a company is prepared to work. "It's easy to get a 5 – 10% cost reduction," says Prahalad, "but you have to completely rethink your strategy to get a 50x reduction in price."

The most startling result, though, is this: products developed to be used by the poor rapidly become innovations that can be used by the rich. Cheap ophthalmic surgery, hotels or cell phone charges rapidly get disseminated. Companies that are able to produce this much of a strategic advantage have no problems convincing customers around the world to shift their allegiance. If a new upstart is offering you a 5% price change you may not be interested; but 50 times less for the same quality?

And so Tata has actually developed their $2,200 ("one-lakh") car for the poor. While the vehicle has only sold 200,000 units, disappointing initial hopes, Tata has gained tremendous insight into the production of a low-cost car. Insight that could be very unsettling to the already insecure US motor industry.

China has become the workshop to the world and not just based on cheap labour. Chinese workers now cost more than South Africa ones, but they also offer significant productivity gains.

The real applications for development may turn out to be of benefit to everyone.

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Businesses must start training people

South African schools are not producing students with the range of skills that are needed for meaningful socio-economic development, claims Johan Botha, general manager of strategic projects within the Production Management Institute.

He warns that businesses in South Africa may grind to a halt if the organisations have to wait for the schooling system to improve and provide the range of skills that can be used within the business community.

He says that because the mathematics passing mark is just 30%, students who have passed at this level would actually be wrong 70% of the time and this is completely unacceptable within the business world.

He says that when people get things wrong in the world of industry and business it can have catastrophic consequences and lead to miners being trapped underground, building workers falling as scaffolds collapse or defective motor vehicles crashing on the roads.

Botha says that, because of the shortcomings in the educational system, businesses are being forced to solve the skills development challenges themselves because they cannot rely on the national education system to provide even the most basic skills sets.

Botha urged more and more South African business to actively start training people and he points out that learnerships that are registered through the relevant Sector Education and Training Authority attract a tax rebate of R60 000 for every learner who successfully completes the programme.

"This amounts to a net tax recovery of R16 800 per learner," he says.

As a further incentive to train, Botha points out that every black learner can have an impact on the broad-based black economic empowerment initiatives and if black learnerships constitute five percent of a company's workforce they will achieve the maximum number of points on the BEE scorecards.

Last year, about 100 employees within large organisations throughout the country achieved their qualifications through learnerships and these ranged from diplomas in production management to honours degrees in scientific fields.

DVB-T2 is now the standard for SA

After an enormous amount of wasted time and energy – coupled with efforts to reassess South Africa's requirements for its terrestrial television services – the Communications Minister, Roy Padayachie, has confirmed that the original digital video broadcasting terrestrial (DVB-T2) technology will be adopted as the standard.

DVB-T2 will allow South Africa to migrate from its analogue television service to a digital service that was due to be introduced by November this year but because of wasteful and pointless further investigations it is now scheduled to happen in December 2013.

Prior to the adoption of DVB-T2, South Africa had adopted the DVB-T standard.

The existing Broadcasting Digital Migration Policy of 2008 will be revised to meet the new timeframe. Padayachie claims that the government will use this migration to revitalise the electronics manufacturing industry and says that his department will continue to work with all industry stakeholders to ensure a successful migration to the new technology.

The DVB-T2 standard has been accepted by 12 other African countries and was originally accepted by South Africa as well until the Communications Department decided to put all aspects of the standard on hold while it investigated an alternative standard.

Because there are numerous other African countries using the standard, South African manufacturers believe that there will be many export opportunities for them.

From December 2013 all analogue televisions sets will require a set-top box to interpret the digital signal.

Apparently the DVB-T2 standard is more advanced than the previous standard. Sentech's chief executive, Setumo Mohapi says that the company has already executed some of the required upgrades and that the infrastructure is in place to enable 50% of the population to use the new digital television signals.

He says that about 60% of television users will be able to receive the new signal by the March this year. He says that the upgrading of civil and mechanical works needed to broadcast the signal were not affected by the new standard because changes could be made to the transmitters – upgrading them from DVB-T to DVB-T2 – without any difficulties.

Sentech says that it will still need to conduct a range of tests to ensure that the DVB-T2 standard is applicable to the South African environment.

CPD Overview

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

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

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

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

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

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

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

For further information visit www.wattnow.co.za

Neotel's auditors express some concerns

Neotel's auditors have apparently expressed their concern that South Africa's second fixed-line telecommunications company may not be able to continue as a going concern because it has failed to take full advantage of the opportunities that exist in the local telecommunications market.

In the latest annual report published by Neotel, its auditors Deloitte & Touche, express the opinion that recurring losses and the shareholders' deficit raise substantial doubts about the company's ability to continue as a going concern.

Tata Communications, the Indian company that owns a 56% stake in Neotel, filed the report with the United States Securities and Exchange Commission. The report says that losses for the year rose to R1,15-billion from R739,5-million in the previous 12 months.

In its filing to the Security Exchange Commission, Neotel reaffirmed that it was confident that it had the funds to remain in business for the foreseeable future but the company did breach its quarterly earnings before interest, tax, depreciation and amortisation targets in the previous three quarters.

Apparently the shareholders and the lenders are discussing ways to meet the funding shortfall and to remedy the breaches. The company has not gained the market share that it hoped to achieve and its chief executive, Ajay Pandey warned staff that retrenchments might have to be implemented to cut costs because of the tough trading conditions prevailing in the South African market.

In a statement released to the media, Neotel says that it is in the process of evaluating its business strategy, operational performance, efficiency and competitiveness with a view to ensuring the long-term sustainability of the company.

"The executive committee and the board are working to ensure that Neotel is sufficiently geared to meet the challenges brought on by the highly competitive market in which it operates," the statement reads.

"As a consequence, the company is considering realignment and restructuring options in order to achieve optimal growth, operational efficiency and improved service delivery to customers," it concludes.

To add to the company's woes, the Environmental Management Inspectorate, also known as the Green Scorpions, has found Neotel guilty of non-compliance with the national environmental laws.

It has found that the company did not complied with certain aspects of its environmental management plan when it installed a fibre-optic cable between Germiston in Gauteng and Cato Ridge in KwaZulu-Natal.

Neotel has denied that its cable does not comply with the environmental legislation.

The Green Scorpions found that a river crossing and the abstraction of water from a water-course had been done without the required permit, that the rehabilitation project had not been developed and as a result, it said, Neotel had not complied with the environmental management plan.

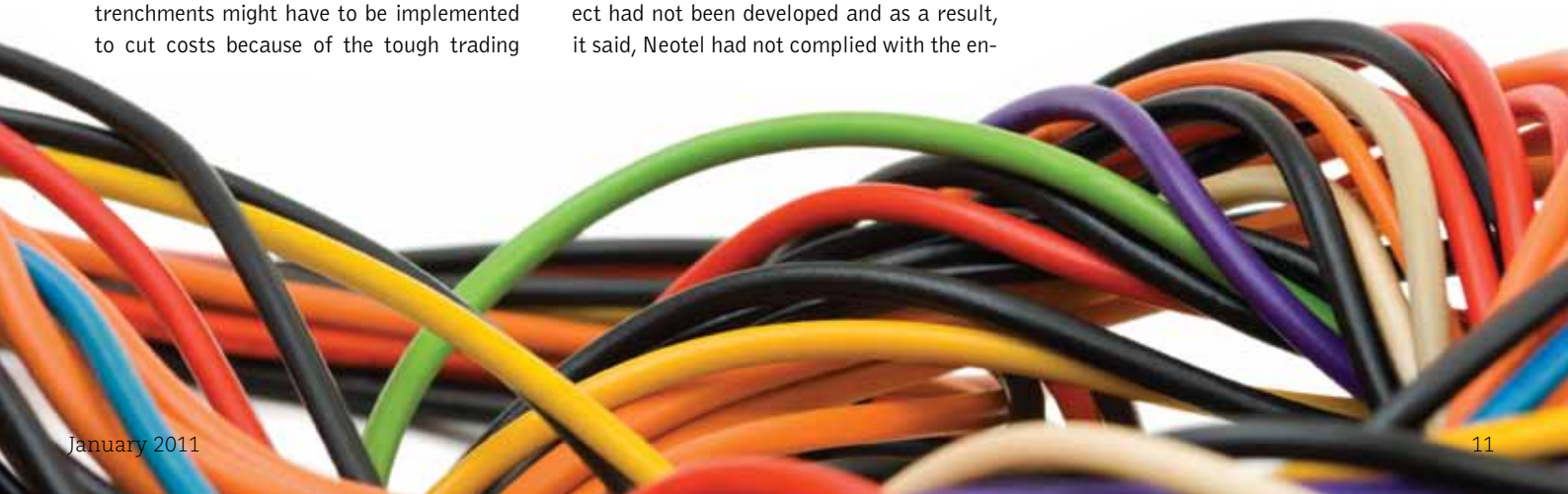
Neotel's chief technology officer, Dr Angus Hay, says that he is aware of the inspection but has yet to receive the actual report following the investigation by the Green Scorpions.

He emphasises that the company has been operating with the correct authorisations at all times and that the provisions of the National Environmental Management Act have also been met at all times. The documentation to support this assertion is in place.

He says there is some difference in the interpretation of the Act and this could have resulted in the findings by the Green Scorpions. The cable that links Johannesburg and Durban is a joint venture between Neotel, MTN and Vodacom although Neotel is responsible for laying the line.

According to Hay, the areas flagged by the inspectorate were in areas where there were already default authorisations in place but the company is waiting for specific details from the inspectorate about the alleged non-compliance.

He says that Neotel is engaged in other large infrastructure projects around the country and the issues are just a small thorn in the side of what is a very large infrastructure project that will lead to, among others, a fibre optic link between Johannesburg and Cape Town.



New partnership for UK university

World-leading expertise from the University of Southampton and Lloyd's Register are being brought together in the largest research collaboration of its kind in Britain.

Drawing together the engineering excellence of both organisations in a new research hub in Southampton, the collaboration will focus on innovations in transport, energy and the environment.

Academics and industry experts will combine forces throughout the entire process of identifying and researching challenges faced by businesses and communities worldwide to more effectively deliver solutions.

Hundreds of staff and students from the University and engineering and technical staff from Lloyd's Register will work together at a new technology and education campus.

Work will start in the New Year on the state-of-the-art University of Southampton Centre of Excellence, which has an initial investment of £116-million.

The campus will include the Lloyd's Register Group Technology Centre, the cornerstone of the organisation's global research and development network. It marks the beginning of a ground-breaking collaboration between the University of Southampton and one of the world's leading knowledge-based organisations, says Professor Don Nutbeam, Vice-Chancellor of the University.

He says by locating the cornerstone of Lloyd's Register global research and development network alongside the University's internationally renowned engineering scientists, it will be possible to establish a research and innovation hub that is unprecedented in its scale in Britain

The university has a 40-year history of collaboration in ship science, marine and energy-related projects and this new hub will extend its level of co-operation to embrace new technologies that address some of society's most pressing problems, as well as providing our students with opportunities to interact with real-time development projects and connect directly with potential future employers.

Richard Sadler, chief executive of Lloyd's Register, says the agreement combines the best of academia and business to simultaneously support industry and society by promoting vital research into subjects such as cleaner fuels, safer work environments and more dependable infrastructure.

The University has received funding from the Higher Education Funding Council for England and the South of England Economic Development Agency to enable the new Centre of Excellence to take shape.

At the heart of the Centre there will be a Maritime Institute, drawing on the University's wide range of expertise in maritime engineering, ocean science, law and business and strengthening links with the existing, highly varied range of marine businesses on the south coast.

The Institute will aim to stimulate innovation, create new businesses and establish the city of Southampton and the wider south Hampshire region as a magnet for inward investment in the marine sector.

The first phase of the development at the University's former Boldrewood campus is scheduled for completion in 2014.

The necessity of IPv6 requires an imbizo of engineers

By Gavin Chait

My broadband connection had been acting up for most of the day. I had been firing off emails to my service provider for hours without result before I eventually picked up the phone to try a direct approach.

The noise coming down the line told me that Internet access was the least of my worries. It sounded like the inside of an old truck trying to go uphill in reverse. While on fire.

At that point I was astonished that my Internet connection was working at all. Calls were entirely out of the question.

The shear robustness of the Internet is thanks to two men, Robert Kahn who worked at DARPA's (the Defence Advanced Research Projects Agency) Information Processing Technology Office, and Vinton Cerf, the developer of ARPANET's Network Control Program protocol.

Their protocols were aimed at reversing the requirement that the network itself be responsible for reliability, and that the hosts become responsible. The network should provide only the functions for efficiently transmitting and routing traffic between end nodes and that the end nodes themselves contain all the clever bits. In this way any network could connect to ARPANET and "internetwork".

For Cerf and Kahn, the eventual protocols would allow networks to run over "two tin cans and a string". Hence the reason my Internet remained functioning even when the phone-line junction box outside my house was sitting in a pool of water, as we later discovered.

In December 1974 Cerf, along with Yogen Dalal and Carl Sunshine published Request for Comments number 675 on behalf of the then Network Working Group. Its title is a piece of history: "Specification of Internet Transmission Control Program".

It is the first use of the term Internet, then a verb meaning "internetworking". They had created TCP/IP. In 1975, two-network TCP/IP communications linked Stanford and University College London. In 1977, a three-network test linked the US, UK and Norway. ARPANET migrated to TCP/IP on 1 January 1983. In 1979, Vint Cerf created the Internet Configuration Control Board which, in 1984, was recreated as the Internet Advisory Board. In January 1992, the IAB established the Internet Society (ISOC) moving the Internet out of the confines of the US military (which is where DARPA resides) into open and civilian hands. The IAB shifted the A to Architecture and created two task teams: the Internet Engineering Task Force and the Internet Research Task Force.

The first RFC was produced back in 1969 by Steve Crocker and describes the ARPA Network. 1,500 RFCs predate the creation of the IETF which in January celebrated 25 years in operation.

Along the way they have held 79 meetings in 15 countries and produced 4,500 RFCs. 70 of them are now Internet Standards, while 155 are considered current best practices. The standards include everything from Telnet, to Ethernet, to NetBIOS, SMTP and UTF-8. That said, the list of proposals that haven't been universally adopted include HTTP, and several thousand others.

Unlike other standards bodies such as ANSI or ISO or even the IEEE "There is no membership in the IETF. Anyone may register for and attend any meeting. The closest thing there is to being an IETF member is being on the IETF or Working Group mailing lists."

The Tao of the IETF was published in 2006 and covers the history, goals and organisation of the task force.

"One of the 'founding beliefs' is embodied in an early quote about the IETF from David Clark: 'We reject kings, presidents and voting. We believe in rough consensus and running code'. Another early quote that has become a commonly-held belief in the IETF comes from Jon Postel: 'Be conservative in what you send and liberal in what you accept'."

Critically spelled out is the following: "One more thing that is important for newcomers: the IETF in no way 'runs the Internet', despite what some people mistakenly might say. The IETF makes standards that are often adopted by Internet users, but it does not control, or even patrol, the Internet." An organisation with no authority over the standards it proposes and no influence to impose those standards. How does it work?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Imagine an imbizo of geeks.

Consider the rural, traditional, approach to resolution and discussion. Whether it be the loya jirga of Afghanistan, the imbizo of Sub-Saharan Africa, or even the folkmoot of ancient Germany, all have a common pattern and purpose.

This is not democracy, it is agreement. The participants at these gatherings expect to remain in negotiation until all agree. This can take time. Members of such a gathering will meet for days to discuss matters of group importance. If there are people who disagree then the majority do not impose their will on the few. Rather, they offer compromises until, eventually, an agreement is reached that suits everyone.

Such a leisurely approach to law-making and arbitration can only work where the pace of life is slow and the complexity of relationships is moderate. Yet, the complexity involved in setting up protocols is tremendous and technology is fast moving.

As Iljitsch van Beijnum, a regular contributor at Ars Technica and IETF contributor, describes it: "New working groups are created regularly, and old ones are killed off almost as often. The real IETF work happens on the working group mailing lists, to which anyone can subscribe. Meeting in person at an IETF meeting can be very valuable—I remember hammering out the last elusive detail of the REAP protocol in the hallways of the Palais des Congrès in Montréal—but it's not a requirement."

The meetings themselves sprawl out over a vast area. "At all times, people are sitting wherever they can find a flat surface—and a power outlet—to work on their laptops or have a discussion. The story goes that at the Minneapolis Hilton, where the IETF has had six of its meetings, someone asked a hotel employee 'where's the IETF?' The bewildered employee answered: 'they're everywhere!'"

Not that everything is always deliberate and serious. RFC 1149 explains "A standard for the transmission of IP datagrams on Avian Carriers".

"Avian carriers can provide high delay, low throughput, and low altitude service. The connection topology is limited to a single point-to-point path for each carrier, used with standard carriers, but many carriers can be used without significant interference with each other, outside of early spring. This is because of the 3D ether space available to the carriers, in contrast to the 1D ether used by IEEE802.3. The carriers have an intrinsic collision avoidance system, which increases availability. Unlike some network technologies, such as packet radio, communication is not limited to line-of-sight distance. Connection oriented service is available in some cities, usually based upon a central hub topology."

It's from 1 April 1990, in case you hadn't guessed.

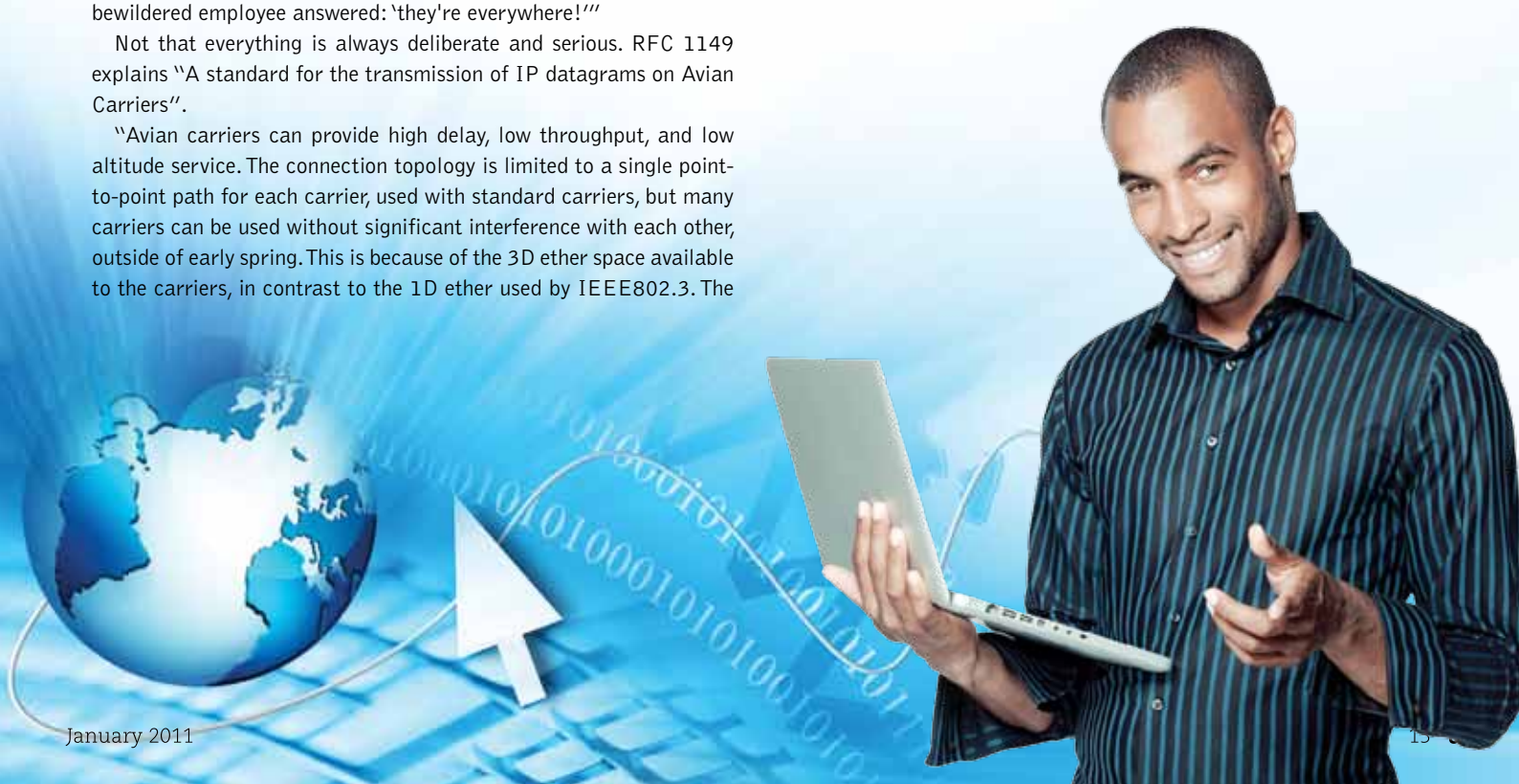
The complexity of the IETF's ambit is sufficient to keep participant numbers low but there are thousands of people with opinions to include. The biggest concern facing the Internet right now is the existing IPv4 standard.

During 2010, more than 242 million Internet addresses were allocated to Regional Internet Registries. That leaves only 495 million which most expect to be used up some time in the next two years. Sometime this year the Internet Assigned Numbers Authority (IANA) will run out of addresses to allocate to the registries.

This isn't just about websites and ISPs. It's about the millions of mobile phones each being connected up to the Internet as well as the massive number of other networked devices, like cars, traffic management systems, GPS devices and even washing machines.

A new protocol, IPv6, was agreed by the IETF as RFC 2460 in December 1998. It took 20 years of discussion and debate to create and was out of date even as it was published. The Internet was only just taking off, remember. IPv4 offers only 4.3 billion possible different addresses whereas IPv6 offers 2128 addresses (that is, 128 bits versus the 32 bit IPv4 standard).

However, to change from IPv4 to IPv6 means also upgrading all hosts and all network routers. It isn't that easy. ➤



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Less than 1 percent of hosts are currently implementing IPv6. Expect a problem in a year or so as the addresses start running out.

The IETF has released more than seven RFCs dealing with the process of transition.

World IPv6 Day, promoted by the Internet Society, is slated for 8 June 2011 and has already attracted heavy-weight support from Google, Facebook and Yahoo!

According to The Internet Society, "The goal of the Test Drive Day is to motivate organizations across the industry - Internet service providers, hardware makers, operating system vendors and web companies - to prepare their services for IPv6 to ensure a successful transition as IPv4 addresses run out."

The Society hopes World IPv6 Day will "expose potential issues under controlled conditions and address them as soon as possible. The vast majority of users should be able to access services as usual, but in rare cases, misconfigured or misbehaving network equipment, particularly in home networks, may impair access to participating websites during the trial.

Current estimates are that 0.05% of users may experience such problems, but participating organizations will be working together with operating system manufacturers, home router vendors and ISPs to minimize the number of users affected. Participants will also be working together to provide tools to detect problems and offer suggested fixes in advance of the trial."

Obviously this is a serious issue and the slow and laborious process of agreeing on standards via IETF does tend to drag. However, these are also critical influencers.

Once something does get through the IETF and make it to a fully-published RFC it is likely to be adopted elsewhere.

Right now there is little demand from end-users because it isn't yet affecting them. It will soon, though, as new devices and Internet-users can't get online because there aren't any more addresses to allocate.

Says Iljitsch van Beijnum "There is no plan B. Despite the long list of the issues with IPv6 and its deployment, there are no alternatives. It took us the better part of two decades to get this far with IPv6, and there's no way we can come up with, implement, and deploy an alternative before the lack of IPv4 addresses becomes a serious problem."

"Unfortunately this has already taken too long," says Brian Carpenter, previous chair of the IETF and currently Professor at the University of Auckland where he researches Internet scaling, "so there will be a considerable period during which IPv4 and IPv6 will coexist and interoperate. At the same time, the expected rapid growth unleashed by IPv6 will make a hard problem - site multihoming - even harder."

IPv6 also works quite differently from IPv4, so expect a lot of services – especially things like voice-over-IP (including Skype) – to suffer from regular failures.

Not that this has stopped the various organs of the Internet Society from getting on with the job of figuring out what the Internet might need in the future.

A recent set of scenario exercises produced a number of ideas, including concerns that the Internet is becoming a set of walled gardens. The success of Facebook, and the big moat it has built around its users has become a source of concern.

Now, a last comment and disclaimer from the IETF: "If you think that you'll get a hot story from attending an IETF meeting, you are likely to be disappointed. Considering all this, it's not surprising that some IETFers would prefer to have the press stay as far away from meetings as possible.

Having a bit of press publicity for protocols that are almost near completion and will become significant in the industry in the next year can be a good thing. However, it is the rare reporter who can resist over-hyping a nascent protocol as the next savior for the Internet. Such stories do much more harm than good, both for the readers of the article and for the IETF."

Reading through the issues being discussed at ISOC, IETF and IRTF is both troubling and rewarding. They certainly are tackling everything from privacy, to spam, to domain name systems to intellectual property.

It's not quite democracy. It's messier, slower and noisier. More like a market of ideas where nothing is simplified to the point of election talking points and media soundbites, but nothing is over-complicated either.

One may not want the engineers designing the décor and furnishings but it's certainly a relief to know that the people looking after the plumbing are more concerned with function than aesthetics.

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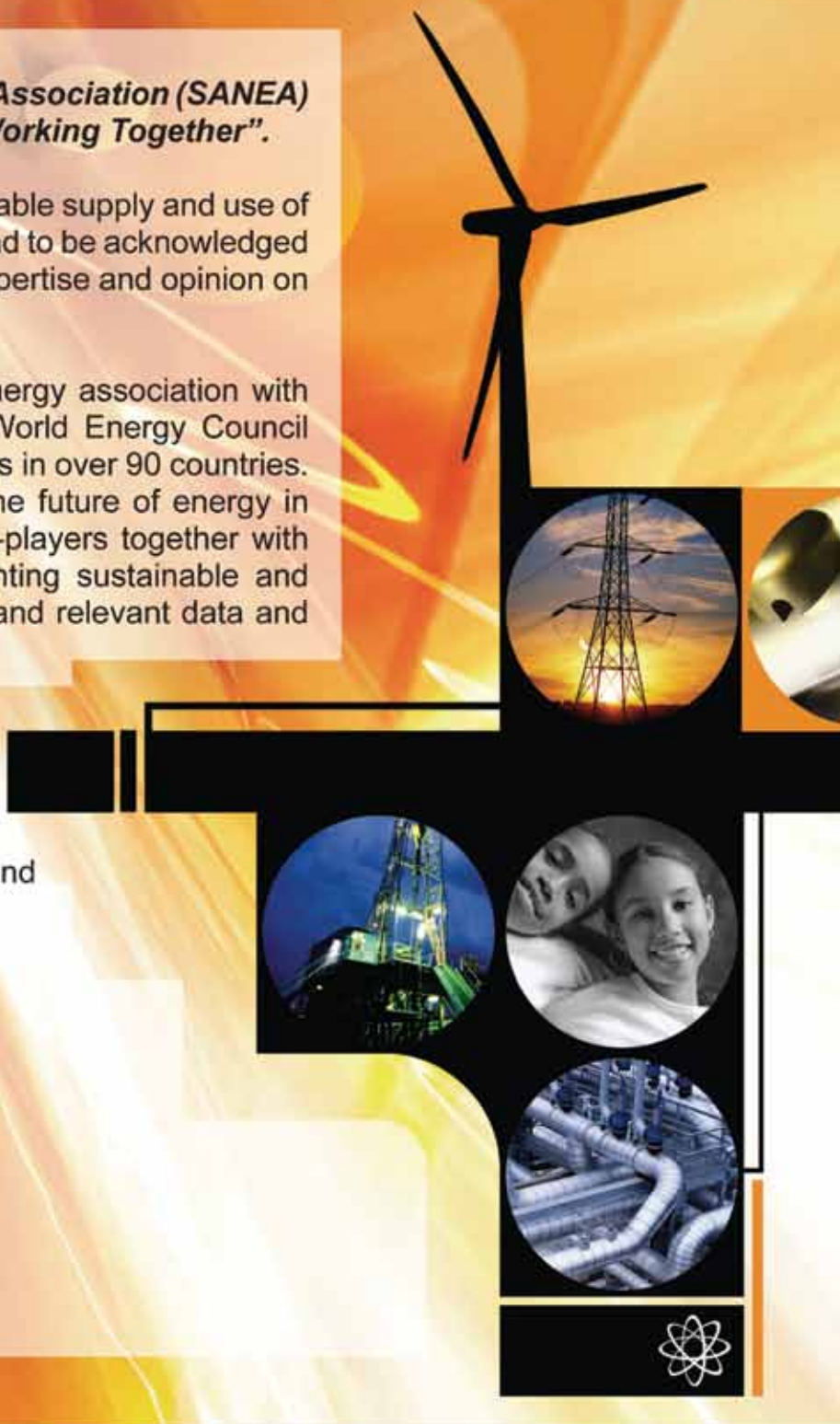


Qubits might be getting closer and closer

Physicists working at Oxford and Keio Universities have used bursts of radio waves to create 10-billion quantum-entangled pairs of sub-atomic particles in silicon and their research offers a glimpse of what computers might look like in the future.

A team of physicists led by John Morton of Oxford University and Kohei Itoh of Keio University described, in a paper published in Nature, how they bombarded a three-dimensional crystal with microwave and radio frequency pulses to create the entangled pairs.

It is one of a range of competing methods to making qubits, the quantum-computing equivalent of transistors.

Transistors store information on the basis of whether they are on or off. In the experiment, qubits store information in the form of the orientation, or spin, of an atomic nucleus or an electron. The storage ability is dependent on entanglement, in which a change in one particle instantaneously affects another particle even if they are widely separated.

The scientists say the new approach has significant potential because it might allow quantum computer designers to exploit low-cost and easily manufactured components and technologies that are already being used in the consumer electronics industries.

There is still much debate over whether scientific or commercially useful quantum computers will ever be built. Scientists have, until now, designed prototypes based on a handful of qubits, too few to offer any advantage over conventional computers in use today.

In binary computers the transistors can either be in an "on" or "off" position but with quantum computing it may be possible to have super-positions where a qubit can be constructed to represent both a one and a zero state simultaneously.

On a two-qubit system it would be possible to compute on four values at once, in a three-qubit system on eight, in a four-qubit system on 16 and so on. As the number of qubits increases, the potential processing power grows exponentially.

Pope's blessing of social networks

Pope Benedict has given his qualified blessing to social networking sites such as Facebook but has warned that online friendships are not a substitute for human contact. The 83-year-old pontiff does not have his own Facebook account, unlike other celebrities, including Queen Elizabeth II.

The Pope said that the possibilities of new media and social networks were huge but warned that there were risks of alienation, self-indulgence and having more 'virtual' friends than real ones.

The message was delivered for the Catholic Church's World Day of Communications and in it Pope Benedict urged users to ask themselves: "Who is my neighbour in this new world?".

The pope did not mention any specific social networking sites or applications but emphasised, instead, that social networking can help to build dialogue and create a positive area for an exchange of views.

"Entering cyberspace can be a sign of an authentic search for personal encounters with others, provided that attention is paid to avoiding dangers of enclosing oneself in a sort of parallel existence, or excessive exposure to the virtual world," the Pope wrote in his message.

Pope Benedict is not technologically smart and apparently still writes most of his speeches by hand, does not use the Internet and is not involved in providing spontaneous responses through applications such as Twitter.

However, his aides are certainly aware of the value of these communications tools and there is a new Vatican website offering an application called, *The Pope meets you on Facebook* and another that allows people to see the Pope's speeches and messages on their iPhones, iPads or iPods.

Visualisation and analysis in the age of BIG DATA

By Gavin Chait

There are lies, damned lies and big data. In 1856, Florence Nightingale was at a dinner party. The Lady of the Lamp was already famous, having just returned from her pioneering work nursing injured solders during the Crimean War.

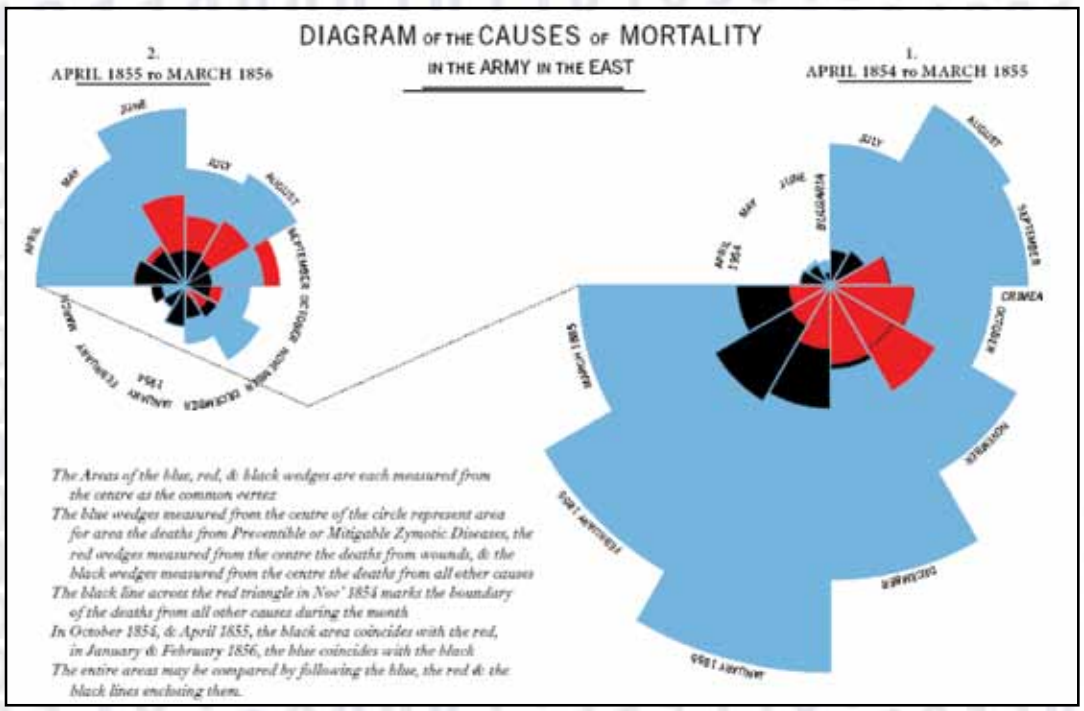
The collapse of the Ottoman Empire had begun and the major European powers were tussling for control of the spoils. 374,600 soldiers died, the vast majority from disease as a result of the poor hygiene in the hospitals where they were treated.

Nightingale had become a campaigner for improved asepsis and was deep in conversation with William Farr, a statistician who had produced the first mortality tables, listing causes of death in the general population. The two formed a partnership that resulted in a royal commission which set about improving sanitary conditions.

Key to their presentation was something that Nightingale takes full credit for: the invention of the pie chart.

"Nightingale's Rose" comes from "Notes on matters affecting the health, efficiency and hospital administration of the British army" published in 1858.

The chart displays the causes of the deaths of soldiers during the Crimean war, divided into three categories: "Preventable or Mitigable Zymotic Diseases" (infectious diseases, including cholera and dysentery, coloured in blue), "wounds" (red) and "all other causes" (black). Even across the gulf of 160 years it makes for a chilling image.



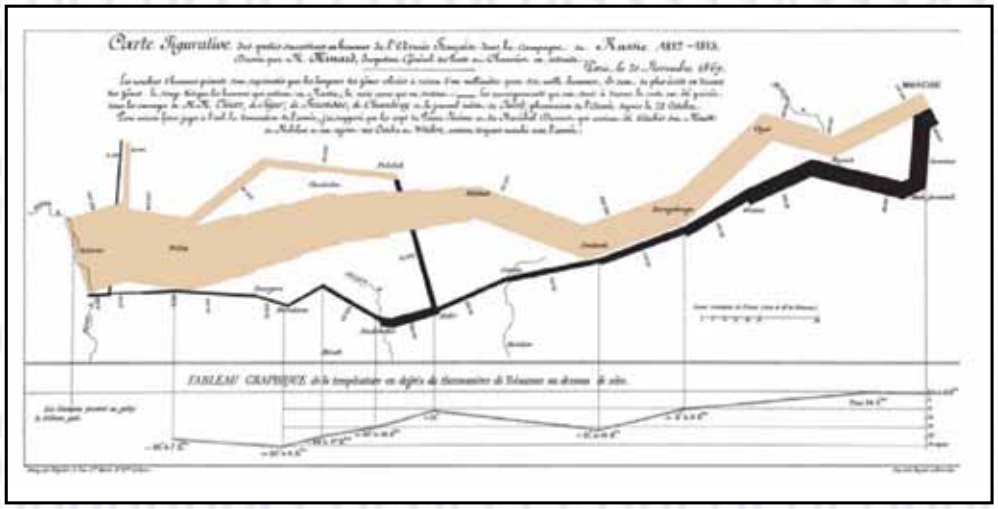
What Florence Nightingale realised is that abstract tables of data are dull and there is little with which the average person can relate.

A musician may be able to pick up a score and instantly hear the music represented by the notes, just as a skilled analyst may see pictures in data. The average person cannot. It's just a page with dots on.

There are numerous famous charts which have changed the way we interact with data.

Edward Tufte, one of the most innovative of modern statisticians, calls Charles Minard's visual representation of Napoleon's Russian campaign of 1812, "the best statistical chart ever drawn."

Minard was 80 years old, and long-since retired from his work as a French civil engineer when he produced his chart in 1861.



Minard's chart tells a tale of tragedy and horror: in 1812, the Grand Army set out from Poland with a force of 422,000; only 100,000 reached Moscow; and only 10,000 returned.

Minard died in 1871 and an obituary of the time honoured him for his innovation to statistical representation, noting that his Napoleonic chart "inspires bitter reflections on the cost to humanity of the madnesses of conquerors and the merciless thirst of military glory".

These are beautiful images and we owe a great deal to their creators who first realised that numbers didn't have to be buried in columns of dry figures.

But now we have something worse. Too much data.

Google doesn't publicise the scale of their server farms but they harness an estimated 450,000 of them, each with 16 Gb of RAM and 2 Tb of disk space. They're adding in additional ones as fast as they can wire them up. That's about 900 petabytes of data.

It's rather a lot.

Add to that the number of big government and multinational data efforts – such as data.gov (for the US), data.gov.uk and data.un.org – and you get a sense of just how much information there is. Stock markets produce price data by the micro-second. Climate data is sampled on a continuous basis. Even war-zones have become some of the densest data gathering and analysis zones in the world.

Nowadays if you want to hide the truth from someone, just present it to them as a big batch of data.

All of this is collectively known as Big Data. And we're drowning in it.

Yet, at the same time, we now have some of the most powerful tools in history to enable interpretation of this data. Sir Tim Berners-Lee, inventor of the Internet and now chairman of the World Wide Web Consortium, has coined the phrase "semantic web" to describe his vision.

"The Web was designed as an information space, with the goal that it should be useful not only for human-human communication, but also that machines would be able to participate and help. One of the major obstacles to this has been the fact that most information on the Web is designed for human consumption, and even if it was derived from a database with well-defined meanings (in at least some terms) for its columns, that the structure of the data is not evident to a robot browsing the web. Leaving aside the artificial intelligence problem of training machines to behave like people, the Semantic Web approach instead develops languages for expressing information in a machine processable form."

There is an obstacle, however. For data to be used in this form first it must play well with others. Too much data is still hidden behind firewalls. Too much data is rendered dead simply because it sits on databases which are incompatible with others.

This isn't just about Wikileaks and the loss of control. Facebook data arguably belongs as much to the members who create it as it does to Facebook. But Facebook doesn't permit anyone to see it.

And corporations spend billions of dollars on expensive database solutions which are perpetually incapable of interoperability. Instead they are forced to spend even more money hiring consultants and market researchers to data-mine on their behalf.

Berners-Lee, realising that his vision of the semantic web may have alienated companies, has commented, "maybe we should have written about enterprise and intra-enterprise data integration and scientific data integration?"

There is a business in there, but corporations aren't yet finding it very compelling.

And so what exactly are we doing with all this data? Mostly it isn't very different to soft-core pornography.

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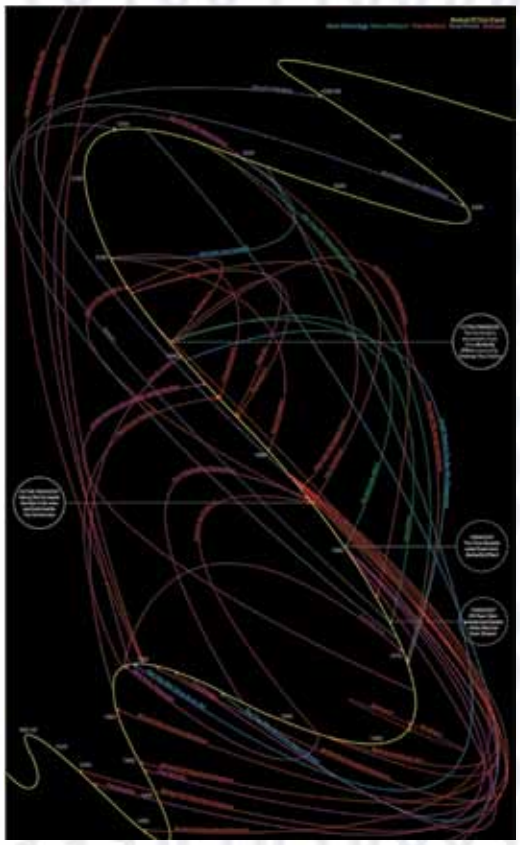
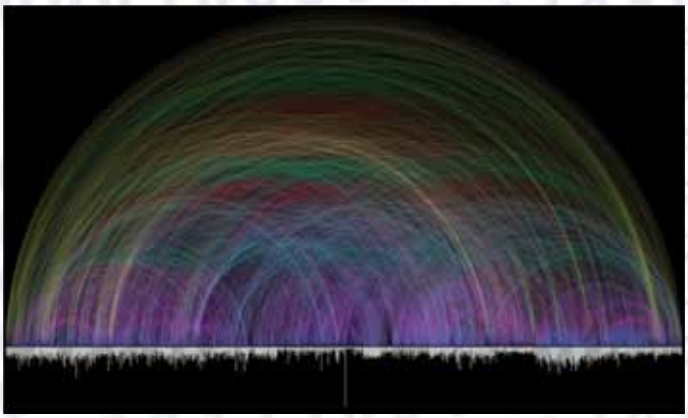


It's by David McCandless of InformationIsBeautiful.net. Yep, it's nothing less than the complete set of timelines for time-travellers in popular movies. Obvious, isn't it?



This is by Chris Harrison and Christoph Römhild and represents cross-references in the New Testament. That one was pretty clear?

Well, this one will be a lot easier. It's by Facebook and visually represents the connections between Facebook friends:

As undeniably beautiful as these images are, one wonders what they would ever be used for. Both Nightingale and Minard, using no more technical tools than pen and ink, managed to produce charts that are both visually compelling as well as instantly useful.

These others?

Of course this is unfair. Professor Hans Rossling's Gapminder visualisation has had a tremendous impact on the understanding of development indicators.

Professor Edward Tufte's sparklines have become a ubiquitous way for contextualising data.

		1999.1.1	65 months	2004.4.28	low	high
Euro foreign exchange	$	1.1608		1.1907	.8252	1.2858
Euro foreign exchange	¥	121.32		130.17	89.30	140.31
Euro foreign exchange	£	0.7111		0.6665	.5711	0.7235

	2003.4.28	12 months	2004.4.28	low	high
$	1.1025		1.1907	1.0783	1.2858
¥	132.54		130.17	124.80	140.31
£	0.6914		0.6665	0.6556	0.7235

Tufte's "intense, word-sized graphics" can be found everywhere from financial pages, to Google web analytics, to the latest version of Excel in Microsoft Office.

Never has so much attention been paid to data visualisation so it should be expected that much of it will be of the same sort of waffle that clogs up the Internet.

Despite this, there is still a great deal of effort being spent on clarity and visual context, rather than the sort of "chart junk" that so incenses Tufte.

So not every chart has to look like this:

.....➤

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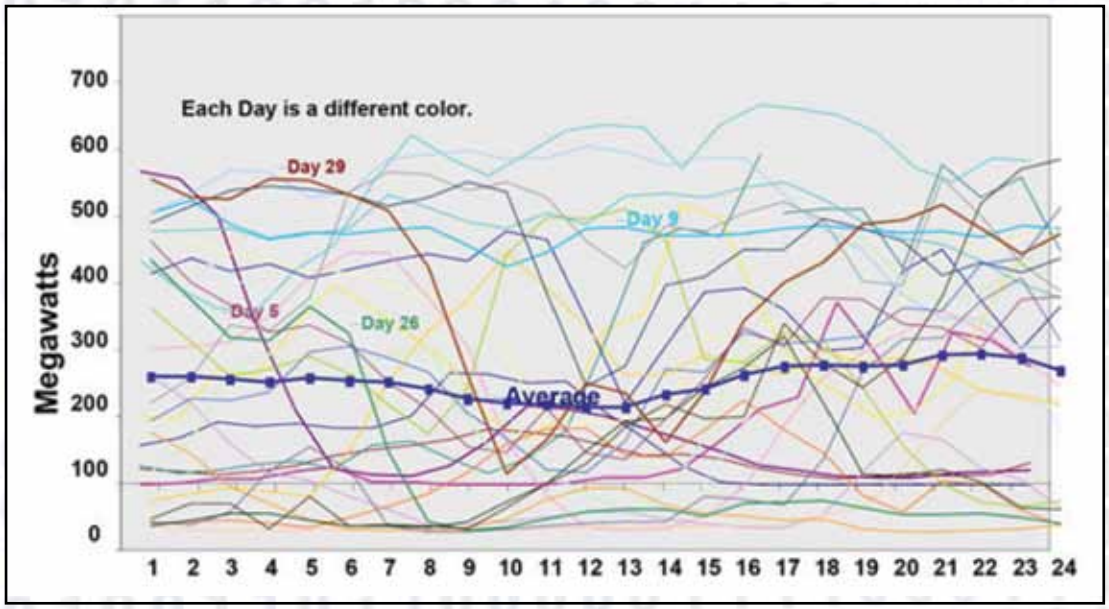

Now the question is, "How do we access this information at close to real-time speeds?"

The two leading proponents of big data are Google and Amazon. Google kicked things off in 2006 with the publication of a paper on their Bigtable key-value memory and data-management system.

"Bigtable is a distributed storage system for managing structured data that is designed to scale to a very large size: petabytes of data across thousands of commodity servers. Many projects at Google store data in Bigtable, including web indexing, Google Earth, and Google Finance.

These applications place very different demands on Bigtable, both in terms of data size (from URLs to web pages to satellite imagery) and latency requirements (from backend bulk processing to real-time data serving). Despite these varied demands, Bigtable has successfully provided a flexible, high-performance solution for all of these Google products."

Amazon followed in 2007 with Dynamo. "Reliability at massive scale is one of the biggest challenges we face at Amazon.com, one of the largest e-commerce operations in the world; even the slightest outage has significant financial consequences and impacts customer trust. The Amazon.com platform, which provides services for many web sites worldwide, is implemented on top of an infrastructure of tens of thousands of servers and network components located in many datacenters around the world. At this scale, small and large components fail continuously and the way persistent state is managed in the face of these failures drives the reliability and scalability of the software systems."

Hard-drives are slow and accessing SQL databases is glacial.

Those large server farms are there to support the massive quantities of memory caching and direct addressing necessary to make things like Google Instant possible.

And before data can even enter this cloud, or be used in fancy charts, it must first be normalised.

Even with the performance of Google and Amazon, there are still vast troves of data lying dead and unexplored. Optimisation is still in its infancy. If you enjoy data and want to make sense of it the opportunities are just endless.

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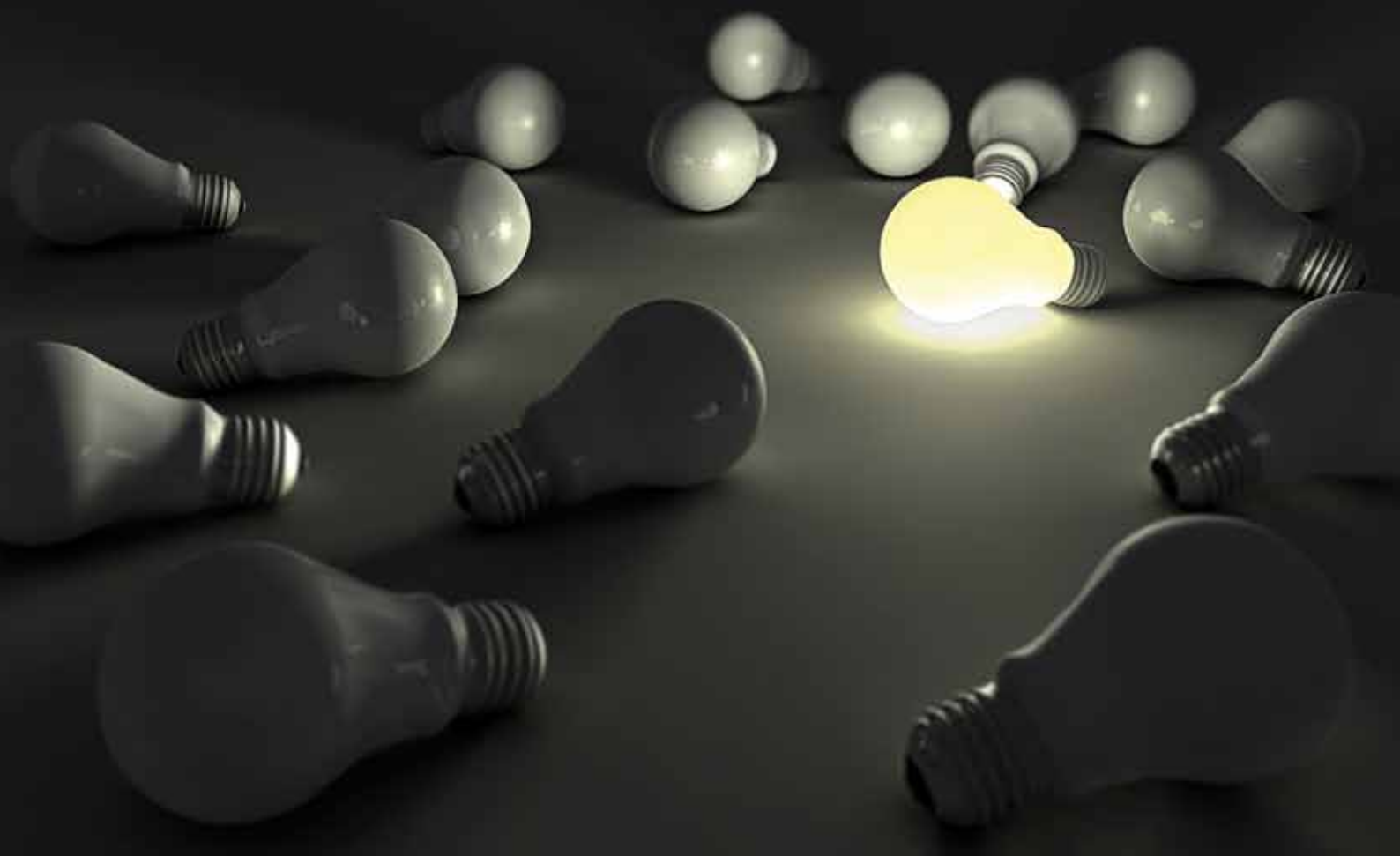
Africa – the true dark continent, now and in future

By Paddy Hartdegen

Africa's electricity supply and generation capacity is in a mess and it is having a serious impact on economic activity, education, public healthcare and individual enterprise. The International Energy Agency estimates in its latest report that 71% of the population in sub-Saharan Africa did not have access to electricity in 2008 – its latest figures.



Demand for electricity is growing at an average of 2,6% a year, but given that huge sectors of the population simply have no access to this energy source, the figures are wildly inaccurate. Based on electricity production, though, they are fair.

Fossil-fuel-fired generation supplied 81% of the region's total consumption and reliance on fossil fuels is expected to continue until 2035. South Africa leads the continent in terms of electricity generation but it has little or no chance of achieving its stated goal of universal access to electricity by 2012.

Generation from hydropower and other renewable energy resources is expected to grow relatively slowly in Africa and this is compounded by the fact that most African countries battle to find partners or to secure funds for any electricity generation projects.

The IEA says that the predicament for Africa is not only developing the new projects and funding them but getting the electricity to the respective users because there is no integrated power grid and transmission facilities throughout the continent are poor.

Southern Africa has established the Southern African Power Pool and this has helped to boost transmission and distribution within the region, but it is largely limited to the southern sections of the continent.

In west Africa, Nigeria is leading the way in its expansion drive and late last year the estimates for the 15 member states of Ecowas showed that electricity consumption in the region is forecast to grow to 22 000 MW in 2020 from just 6 500 MW in 2003.

Ecowas commission ambassador, James Gbeho told delegates attending the Ecowas Business Forum in Abidjan that there was an urgent need to increase energy generation capacity but that this would largely have to be financed by the private sector.

He conceded that currently less than 30% of the population of the 15 member countries had access to electricity and that there were widespread disparities between people in urban areas and those in rural areas.

Gbeho claimed that the private sector had the capacity to contribute to the growth in the provision of electricity by increasing its investment in generation capacity.

Like many of these predictions, though, the establishment of fundamental and unbreakable rules for the various member states must first be established and enacted. Gbeho said that Ecowas was making significant progress on getting the regulatory frameworks in place and pointed to the establishment of the West African Gas Pipeline and Power Pool as an example.

There is an Accra-based Ecowas Regional Electricity Regulation Authority in place and there is also the Praia-based Centre for Renewable Energy and Energy Efficiency that will contribute to the regulatory framework.

Tunisia raises funds with ease

Tunisia, caught in the grip of a civil and political uprising, has been given a €185-million loan by the European Investment Bank that will be used to improve its electricity distribution network using high-voltage overhead lines and underground cables.

The Tunisian Electricity and Gas Company (STEG) has a number of new plants that have come on stream over the past few years but the country is battling with an inadequate distribution infrastructure and is now spending 810-million Dinar to improve distribution.

The EIB has also agreed to provide €194-million towards the construction of the new Sousse power station that is due to start operating in 2013. Apart from the European investment, Tunisia has also received funding from the Islamic Development Bank, which provided the country with a €205-million loan.

In reality, these are just terms and bodies that have been established and have achieved very little in investment, in defining new projects or in raising, through private and public partnerships, the investments needed to boost electricity generation.

However, the Ecowas Commission says that it has done much to stimulate investment in the area by reviving "moribund structures" and "creating new ones" that will support regional development.

The main points are really simple ones: Where is the money? Where are the projects? Where are the investors? Where is the distribution infrastructure? Where are the maintenance and engineering teams?

Most of these questions remain unanswered and there are signs that investment levels are much the same as they have been for years.

A report from Nigeria last year confirmed that the Bureau for Public Enterprises (BPE) condemned a call by group calling itself the Joint Action Forum (JAF) for the immediate privatisation of the Power Holding Company of Nigeria (PHCN).

JAF has accused the Nigerian government of embarking on a fruitless privatisation programme for the power utility since 2005, a comment that has been referred to as fallacious by BPE's spokesman Chukwuma Nwokoh.

So while Ecowas is saying that things are getting better and regulatory frameworks are in place for greater privatisation, the JAF is saying that in five years Nigeria's BPE has achieved little or nothing in privatising its electricity utility or increasing power supplies.

JAF says that while 20 private power companies have been granted licences by the Nigerian Electricity Regulatory Commission, they have not added a single megawatt of power to the grid and appear unlikely to do so in the future.

Nwokoh refutes this claim as well by saying that Agip and Shell are generating 450 MW of power each and that AES is producing 200 MW. However, the problem is that the PHCN does not have the money to pay the independent power producers.

Nwokoh again refutes this by saying that while the power utility might have some financial problems, the oil companies that are generating power have a sovereign guarantee that they will be paid.

A reform of electricity generation in Nigeria was mooted in 2005 when the Electric Power Sector Reform Act was passed and, in terms of this legislation, the PHCN was to be unbundled into 18 entities comprising six generation companies, one transmission company and 11 distribution and marketing entities. It hasn't happened.

The figures from Nigeria are quite alarming if you get beyond the bickering between organisations such as JAF, BPE and PHCN. The reality is that Nigeria has an estimated population of 150-million (three times greater than South Africa) and yet is producing just 22 000 MW at peak, if all the generation capacity is used. That is less than 10% of South Africa's capacity. And 30% of the 3 500 MW in Nigeria comes from private sector oil companies.

This gives you some idea of the scale of the problems facing Africa when it comes to electricity supplies.

In Ghana, estimates are that about 45% of the population, including 15% of rural residents, has access to electricity and about 80% of consumption comes from urban areas.

Ghana is aiming to double its electricity generation from its current level of about 2 000 MW to about 5 000 MW by 2015. The goal is outlined in the country's National Energy Policy. This figure is just more than 10% of South Africa's current capacity and less than 10% of its forecast capacity by 2015.

In Gabon, the 2004 figures indicated that the country was capable of generating just 400 MW of electricity countrywide. Or, to look at the figures differently, South Africa has a generation capacity of 227,2-billion kWh compared with Gabon's 1,5-billion kWh and Nigeria's 19-billion kWh.

In fact, even Egypt generates less electricity than South Africa, providing just 92-billion kW/h to put it in second spot for the amount of electricity generated throughout Africa.

The figures make dismal reading and I have included just the top three from each region of the continent as an indication of how serious the problem is:

- North Africa: Egypt (91,7-billion kWh); Algeria; (29,4-billion kWh) Libya (19,4-billion kWh);
- East Africa: Kenya (5,7-billion kWh); Tanzania (2,6-billion kWh); Uganda (1,9-billion kWh)
- West Africa: Nigeria (19-billion kWh); Ghana (6,5-billion kWh); Cote d'Ivoire (4,6-billion kWh)
- Central Africa: Republic of Congo (6,8-billion kWh); Burkina Faso (400-million kWh) Democratic Republic of Congo (353-million kWh).

The worst performing countries on the African continent are Equatorial Guinea with 26-million kWh, Guinea-Bissau with 58-million kWh and Benin with 82-million kWh.

Even a country like Rwanda, where a major privatisation drive is underway, cannot get close to providing its citizens with a modest electricity supply as its installed capacity amounts to just 93-million kWh. Are things likely to change?

Clearly Ecowas is not achieving much despite its assertions that the regulatory frameworks are in place and that the road to privatisation is well and truly open. In Tanzania the picture appears to be somewhat more heartening as some bigger projects are underway.

The quality and supply of electricity in the East African Community is considered to be of the worst in Africa according to an industrial policy document released by the EAC late last year.

It says that the most pressing problems facing businesses in east Africa are directly related to a lack of electrical power and that this lack of capacity is characterised by frequent power outages, low electricity connections and high electricity tariffs.

It says that hydroelectricity accounts for about 80% of the energy generated in the region and yet in the average month, there are at least 11 outages within the EAC. Connectivity is estimated at just 7% of the region's entire population.

The report says that Kenya's installed hydropower capacity is just 677,3 MW while Tanzania, which is connected to the Southern African Power Pool, has fewer outages and cheaper access to power than its neighbours.

Rwanda generates just 20 MW of thermal power while 5 MW comes from a methane gas power plant at Gisenyi and 9,5 MW from the Nyabongo Power Station.

The report goes on to quote industry analysts who say that the three countries suffer from distribution inefficiencies, huge power losses, inaccurate billing systems, poor record keeping and illegal connections to the limited power grid.

Rwanda's new hydro plant

A new 9,5 MW hydro-electric plant is generating electricity using water from the Nyabarongo River and the government now has plans to extend this plant to provide 28 MW of electricity in an attempt to improve electricity supplies in the country. The new plant was completed at a cost of $23,5-million.

Astonishingly, the new 9,5 MW plant contributes 11% of the total generation capacity in the country. The new hydro-electric plants will be completed in February 2013.

A feasibility study is underway for a project on the Rusizi River that will have a generation capacity of 145 MW were completed and, if it gets the go-ahead, would take five years to build. The electricity will be shared by Rwanda, the Democratic Republic of Congo and Burundi.

Another project on the Rusumo River will add 61 MW of power to the country's grid. However, the electrical power will be shared by Rwanda, Tanzania and Burundi. Government officials in Rwanda are looking to expand industrial production in the country by 12% a year but this needs electricity to do so. As a result, government statements propose increasing access to electricity by 30% a year and increasing energy production from the current level of about 80 MW to 1 000MW. Details of how these projects will be funded or built remain sketchy.

Uganda is part of the community but figures on its electricity generation capacity or consumption were not included in the document.

The East African Community is a region with a population of 126-million people. It occupies an area of 1,8-million square kilometres and has less than 20 000 kilometres of paved roads. Telecommunications levels are abysmal with cellular phone connectivity of just 126 lines per 1 000 people, making it one of the lowest cellular phone markets in the world. In Mozambique, the picture is slightly more heartening, with electricity once again being generated at the Cahora Bassa scheme and South Africa providing the country with a stable amount of electricity each month.

The local energy company, EDM is planning to connect 120 000 households in the grid over the next 12 months and will link the district capitals of Mecanhelas, Metarica, Maua, Marrupa and Sanga in the northern province of Niassa to the national power grid as well.

The EDM has already connected 89 of the 128 district capitals of the Tete province to the national grid. It has launched its third phase project to electrify the northern province of Cabo Delgado and its district capitals by the end of this year.

EDM has a client base of 736 095 customers who are receiving a consistent supply of electricity from and about 14,3% of Mozambicans have electricity in their homes.

While the electricity supply in South Africa is leaps and bounds ahead of anything else on the continent, the picture here is not one of joy and boundless levels of energy either.

Eskom has already warned that there might be power outages in the coming year because its reserve margins are tight and it has opened negotiations with a number of independent organisations to buy additional power for the winter months when the reserve margins are expected to be tested.

Eskom chief executive Brian Dames says the organisation has already approached the owners of several large shopping malls and hospitals and offered to buy capacity from them should Eskom capacity be over-extended during the next two years.

Eskom is forecasting a winter peak of about 38 000 MW and, with its imports, the utility has a nominal capacity of about 43 000 MW and views anything less than 2 000 MW of reserves as potentially problematic. Apparently the offer made by Eskom to the owners of the mega-malls in Gauteng, KwaZulu-Natal and the Western Cape would be less than the costs of operating the open-cycle turbines, which cost R2 800 per MWh to run.

Eskom has also approached the Tshwane and Johannesburg councils to secure an additional 200 MW of coal-fired capacity from these authorities if necessary. Both Tshwane and Johannesburg have installed gas turbines, which could add another 100 MW of peaking capacity.

Eskom's Andrew Etzinger refers to a 'demand response aggregator', which will facilitate the purchasing of as much as 500 MW of power from small industrial and commercial entities during the 2011 winter peak. In addition, Eskom has embarked on an electricity conservation scheme with its industrial users and is requesting that they reduce electricity consumption by 10%. However, this scheme is voluntary. Industrial consumers gobble about 25 GWh of power a year and because of this Eskom and the Department of Energy are keen to make the electricity conservation scheme mandatory for all industrial users.

Nigeria seeks $35-billion for electricity

Nigeria is hoping to raise $35-billion through a privatisation programme over the next ten years that will see the state-owned Power Holding Company Nigeria being sold along with the distribution companies and putting the country's entire electricity grid into the hands of the private sector.

The scheme has been proposed by President Goodluck Jonathan but it has made many ordinary Nigerians angry because they say the power supply is erratic and even privatisation won't help it to get power to the people.

At this point, the entire generation capacity of the country is equivalent to the amount of power used by people living near the Narita airport in Tokyo.

South Africa, which doesn't provide universal access to power for all its people, currently uses 55 times more power per head than the people of Nigeria. In America, the figure is 100 times.

Nigeria's power supply has been stagnant for more than 30 years because there has been little or no investment in the sector in spite of surging demand for a consistent power supply.

Although new generation capacity has come on stream in the past ten years, the distribution system in the country is so fundamentally dysfunctional that the consumption levels have largely remained unchanged in 30 years.

Two-thirds of the electricity consumed in the country comes from basement or backyard generators and this source of power is estimated to cost the country about $13-billion a year in pure running costs.

Generator manufacturing companies have enjoyed a consistent boom for years and merchants say that the government is probably the biggest buyer of these units.

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While South Africa has exceptional levels of electricity generation compared with the rest of Africa, the reality is that South Africa's own performance is going to be tested as electricity distribution levels decline. Already the government has announced that the plan to implement regional electricity distribution has been abandoned and the Department of Energy is believed to be working with individual councils around the country to look at ways of improving distribution.

Reports vary but some estimates put the level of capital needed to restore the distribution infrastructure and undertake essential maintenance work to be as high as R60-billion.

Eskom generates about 95% of the electricity used in South Africa and this is equivalent to about 45% of the energy used throughout the continent. South Africa generated 228 942 GWh in 2009 and 92,6% of this came from its coal-fired power stations.

It operates a transmission network of 28 236 kilometres of ultra-high voltage networks across the length and breadth of the country. The electricity is supplied to 187 municipal electricity distributors.

The World Bank has invested $4,99-billion in 11 electricity projects in Africa through its Africa Energy Unit during the previous financial year. However, the electricity usage picture in Africa is particularly dismal and World Bank figures show that less than 10% of sub-Saharan Africa's rural households have access to electricity, and the overall access level is less than 25%.

Here's a list of some of the World Bank's Africa electricity projects that are currently underway:

- A project (P069258) that was approved in 2003 and is due for completion in 2012 is aimed at creating an efficient regional power market for the Southern African Development Community. It has been restructured in the past year and additional financing has been provided. However, to date only $58,9-million of the allocated R189-million has been disbursed. So the money sits in the coffers but the World Bank says that no progress has been made in achieving more efficient regional power in the SADC.
- Another project (P075994) aimed at developing a power pooling mechanism among national power utilities in the Economic Community of West Africa (Ecowas) member state has been underway since 2005. High voltage transmission lines have been erected between Tema and Takoradi in Ghana. So far just $19,8-million of the $40,5-million project cost has been disbursed.
- A project (P084404) to improve transmission lines between Mozambique and Malawi started in 2007 and is due for completion in 2013. It will increase access to reliable and affordable electricity in Malawi and create opportunities for bilateral trade. However, the project has been hampered by cancellation of the Malawi credit after the government there said that the project was not a priority. As a result, the World Bank will invest in Matambo sub-station and help Electricite de Mozambique (EdM) build its capacity and technical support at a cost of $45-million.
- In West Africa, the Niger Basin Water Resource Project (P093806) is underway and will provide access to electricity from a hydro-electric power plant to the residents of the region. About $183-million is being spent on this project.
- A project to augment the supply of hydro-electric power to the national utilities of Mali, Mauritania and Senegal is underway (P094916) was started in 2006 and is due for completion in 2013. It also seeks to develop the nucleus of a co-operative power pooling mechanism for the West African Power Pool Zone B. The total cost of the project is about $156-million.
- A project to ensure a more stable and reliable exchange of power is underway in the WAPP Zone A area (P094917) that includes Cote d'Ivoire, Ghana, Benin/Togo and Nigeria in an effort to alleviate or reduce power supply disruptions. The amount allocated for this is almost $62-million. The project has been delayed because of problems with the Tema-Lome transmission line that is being funded by another unnamed donor.
- A project (P097201) at the Inga hydro-electric power plant was started in 2007 and is due for completion in 2013. It will see the generation capacity at Inga 1 and Inga II increased to 1 300 MW. However, the project has experienced delays in procurement packages and has not received a concession from the electricity utility Societe de Nationale de Electricite. Despite actions to enhance project implementation that included an agreed action plan with government, the objectives of the project cannot yet be achieved. As a result the project will, according to the World Bank, be delayed until at least 2016. The objective of the project is to improve the electricity sector's efficiency in that region, expand generation, transmission and distribution capacity to sup-

Four nuclear plants for Egypt

Egypt's government has announced that it will issue a tender for construction of a new nuclear energy plant and bidding companies will be given six months to submit documents and plans.

Egypt has said that it intends moving away from oil and gas as the source of power to generate electricity and wants to build four new nuclear plants by 2025, with the first of these planned to start producing electricity in 2019.

Electricity and Energy Minister Hassan Younes says the state council has reviewed the tender documents. Already there have been expressions of interest from companies in France, the United States, China, Russia and Japan.

Egypt has appointed Australia's Worley Parsons to act as its consultancy.

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port domestic power demand and regional market integration. The World Bank has allocated $298-million to the project.

- In Benin, a project to accelerate use of electricity with a goal to improve economic growth and the quality of life is underway (P079633) was started in 2004 and is due for completion this year. The Togo-Benin transmission and interconnectivity is operational. The World Bank says a decree has allowed for the establishment of a regulatory agency that has now increased electricity tariffs and this has allowed for restructuring of the debts of the electricity utility. The World Bank spent $64-million on this project, which, when minor work has been done, will be completed at the end of this year.
- The Morupule generation and transmission project (P112516) in Botswana will see the development of an affordable and reliable supply of electricity for the energy sector. The World Bank has allocated $136,4-million to this project.
- In Burkina Faso, (P069129) a project to improve the availability and reliability of electricity supplies was started in 2004 and is due for completion this year. The 225 kV transmission lines between Bobo-Dioulasso-Ouagadougou have been completed and commissioned. Rural electrification work is now starting. The energy efficiency component of this project is performing well with energy audits in 10 public buildings and five administrative buildings. Plans are underway to provide 29 000 energy saving lamps there. $67-million has been spent on this project.
- In Burundi a project started in 2008 (P097974) to increase access to water in peri-urban areas of Bujumbura and improve the quality and reliability of access to electricity has been started and will be completed in 2013. The total cost of the project is $46,5-million and about 80% of the funds allocated to electricity will be spent on providing and installing 10 300 prepaid electricity meters.
- In the Central African Republic a project (P114111) is underway to restore a reliable supply of electricity to consumers in Bangui that includes essential services such as water supplies and hospitals. Little progress has been made on this project costing $10-million because of what the World Bank calls unexpected delays.
- In the Republic of Congo, a project to improve access to basic infrastructure and services, including electricity, is underway in Brazzaville and Pointe Noire. About $25-million has been allocated to it.
- In Cote d'Ivoire, a project (P112573) to improve the efficiency, availability and reliability of electricity at a cost of $52-million was started in 2009 and is due for completion in 2012. However, political uncertainty in the country, coupled with a lack of action on pricing and tariffs (including gas pricing) has hampered the project.
- In Ethiopia a project worth $335-million was started in 2002 and is due to be completed in 2013. The project (P049395) will expand access to electricity and improve the quality of the supply. An additional $180-million that has been allocated to improve the distribution of electricity and rehabilitation of the distribution infrastructure has largely been completed in Addis Ababa. Progress on medium voltage and pole transformers is about 60% complete. Implementation of the rural electrification scheme has been achieved with 62 of the 65 towns having access to electricity. About 80% of the 300 photovoltaic systems for schools and clinics have been installed. Five mini-hydro plants have been connected to the grid.
- In a separate project (P097271) access to electricity is being provided in rural communities at a cost of $140-million. In addition to the 380 towns receiving electricity another 65 are being connected to the grid. By the end of the project, 4,6-million compact fluorescent lamps will have been distributed throughout the country. Three other energy efficiency studies are underway to assess using electric injera baking stoves, increase the power factor through the installation of capacitors in critical areas of the network and options for disposing mercury-laden lamps.
- Also in Ethiopia, a project (P101556) to establish a sustainable method of expanding access to electricity in rural communities is underway at a cost of $129-million to support economic development and alleviate poverty. The project implementation was delayed because of electricity shortages but with new power plants being commissioned it is now back on track.
- In Ghana, a project (P074191) worth $278-million is underway to improve the efficiency of the country's electricity distribution services. The Electricity Company of Ghana is building

SA consumption just keeps growing

South Africa's power consumption just keeps on climbing and Statistics South Africa says that in the 11 months to November 2010, power consumption was up by 2,6% to 19 742 GWh. Power sold to neighbouring countries increased by 5,3% but the country purchased 11 263 GWh of electricity from its neighbours. Electricity production in South Africa rose by 3,4% in November.

According to Business Monitor International (BMI), South Africa's thermal generation reached 256 TWh in 2010 with 77,6% of it coming from coal-fired power stations. Oil produced about 19% of the electricity while nuclear produced just 2,2%. BMI forecasts that the South African real gross domestic product growth will average 3,9% a year between 2010 and 2014 while the population is expected to rise from 49,7-million to 51,7-million.

South African electricity consumption per capita is expected to rise by 16%, prompting an increase in total consumption to 252 TWh by 2014. BMI rates the country ahead of Nigeria in its Power Business Environment Ratings mainly because of South Africa's market size, low levels of import dependence and reasonably high use of renewable energy resources. However, it warns that the South African energy sector is not competitive, as the country has made little progress towards privatisation while its regulatory environment remains restrictive and unattractive.

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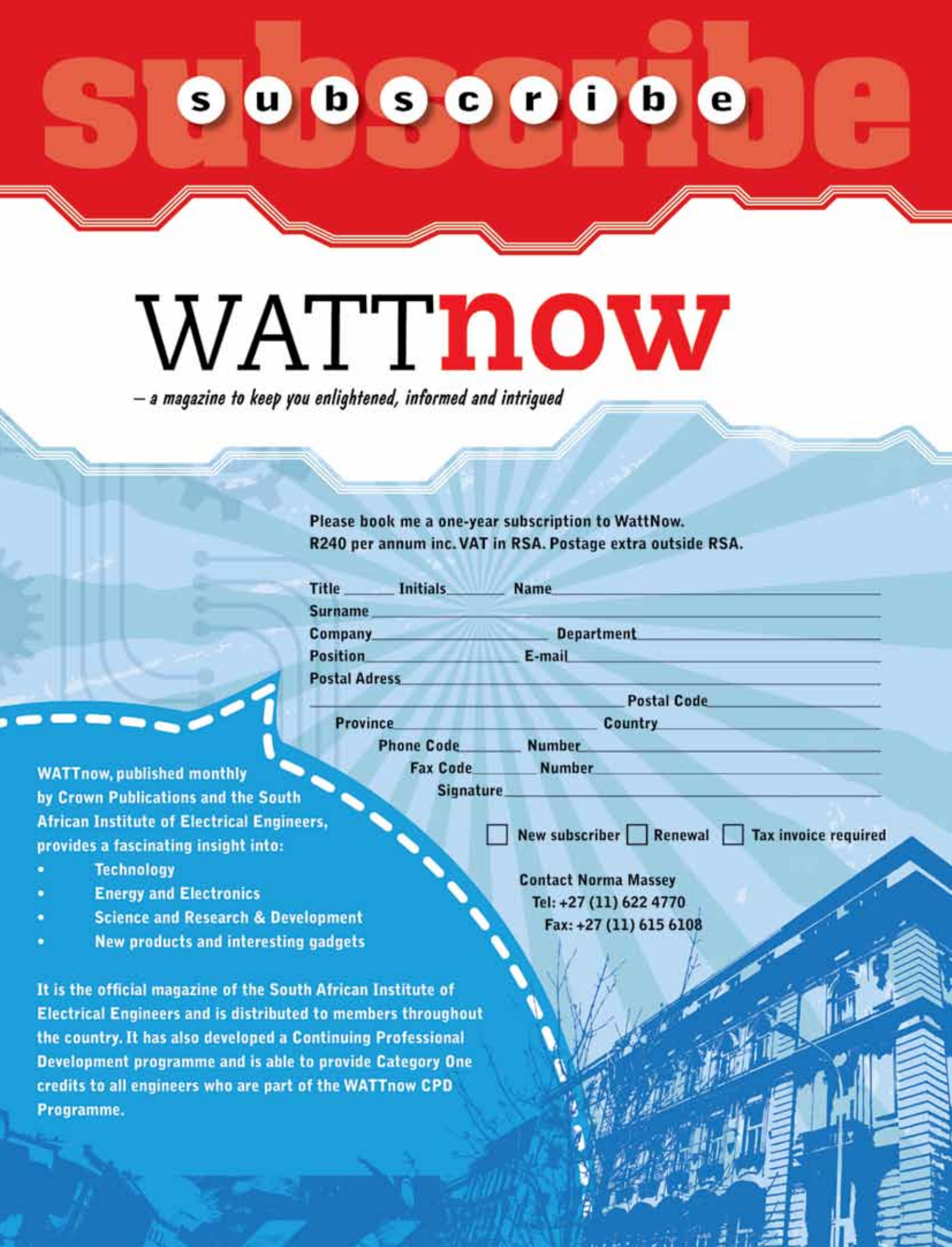


and installing works at various locations around the country to provide widespread access to electricity. The photovoltaic programme has been delayed with only 75 rural health centres being equipped with this form of power. The target of providing more than 10 000 home solar systems has not been met and is unlikely to be achieved.

- In Kenya, a project to increase access to electricity (P083131) in urban and peri-urban areas started in 2004 and is due to be completed in 2013. The Olkaria II Unit 3 has been handed over to KenGen and is fully operational. Moreover, Kenya's Energy Act has been implemented and the number of independent power producers has risen to five. There are 240 000 households connected to the grid and the number of combined monthly interruptions of service (for the 66 kV and 33 kV lines) is now down to three. $164-million has been spent on this project. The World Bank has allocated an additional $325-million to Kenya to improve its electricity supply and expand access to electricity in urban, peri-urban and rural areas. This second project (P103037) is due to start soon and will be completed in 2016.
- In Madagascar, a $10-million project to improve the electricity and water supplies in urban areas started in 2006 and was due to be completed in 2009. The project (P095240) forms the basis for a sustainable expansion of commercial electricity service in the country. However, political and civil disturbances have meant that this project has ground to a halt and it's unlikely that it will be achieved any time soon.
- In Mali an energy support project (P108440) is underway to improve the electricity services in Bamako at a cost of $124-million. It is due to be completed in 2014 having started in 2009.
- In Mozambique a project (P10844) to increase access to electricity in peri-urban and rural areas was approved last year and the World Bank will provide $76,6-million for this. No further details on the plans are available as yet.
- The World Bank set aside $172-million for a project (P090104) to improve Nigeria's electricity supplies and it was supposed to be completed by 2010 but has now been extended to 2012. The Nigerian Electricity Regulatory Committee has been established and the World Bank says the Power Holding Company of Nigeria has been unbundled but not yet privatised. Work is due to start on projects that are aimed at improving the quality of supply, the distribution system, system losses and improved end-user voltages. The World Bank has cancelled non-performing contracts because the restructuring of Nigeria's power sector has not happened. The Nigerian government has decided to fund the transmission system development component of the project itself. Studies of the rural and peri-urban models for electrification have been abandoned after cancellation of non-performing contracts by the World Bank. Another project (P106172) to improve the gas supplies to increase electricity generation and to improve transmission and distribution has been approved by the World Bank and is due for completion in 2014. This project is worth $199-million.
- In Rwanda, a project (P111567) worth $69-million is aimed at getting cost effective electricity services to households and priority public institutions throughout the country but how this will be achieved is not part of the World Bank's current report so details will be available later.
- In Senegal, the World Bank will spend $16-million on projects aimed at improving that country's electricity supplies after the Kounoune I power plant was completed. However, the project (P073477) was due to be completed by the end of last year but the Senegalese electricity utility's financial position has deteriorated badly and the World Bank now says the local electricity industry needs to be restructured before the country will achieve a stable electricity sector.
- In Tanzania, the World Bank provided loans worth $128-million for the improvement of electricity supplies to Dar es Salaam, Arusha and Kilimanjaro in 2007. The project (P101645) also set out to provide a sustainable basis for energy expansion and renewable energy development. The Bank approved additional funding for the project in April last year so that Tanzania could implement additional measures to improve the electricity supply. The improvement project is now due for completion in 2015.
- In Uganda, a $310-million project (P069208) was approved in 2007 to reduce short-term power shortages and expand elec-

Wumba without electricity for 35 years

Abudja, the flagship city of Nigeria that became the country's capital in 1991 after the government moved away from the crumbling, over-crowded and decrepit city of Lagos, still does not provide its citizens with ready access to electricity.

In the centre of the city, the Wumba community, which has been living there for 35 years, has not had any electricity in all that time. Things might be about to change as Haruna Gazaho has been appointed chairman of the new light committee that has been tasked with getting electricity into the area.

However, there are enterprising people living there who have their own generators and will recharge a person's mobile phone for N50 a time. They are shelling out thousands of Niara a day on fuel for the generator but are still making a profit because the demand for cellular phone power is so high.

Because Wumba has no electricity grid, it is possible to rent a room for N12 000 a year and a one-bedroomed flat for N50 000 annually. That's incredibly cheap by Nigerian standards.

Good roads, reasonable access and water mean that the area could be an attractive option for those wanting cheap accommodation but the main problem is that there is no stable electricity supply.

Gazaho says the community must raise about N1,5-million to buy poles and wires for an electricity grid and if it does so then the Power Holding Company of Nigeria will connect them.

But raising this sort of money seems remote for the people of Wumba and even Gazaho admits it's a daunting task.

tricity services throughout the country. However, the World Bank says that the medium and long-term financial sustainability of the Uganda Electricity Transmission Company is uncertain and this means that there is a high risk that the objectives of this project will not be achieved. Uganda's generation deficit has been reduced through the commissioning of a 130 MW emergency thermal generation unit (including the Mutundwe power plant that generates 50 MW). The country's deficit is estimated at 15 MW. The government wants to increase its generating capacity by 3 000 MW by 2015 through its National Development Plan and the World Bank says that this means it's imperative to develop a cost development plan now so that the government's objectives can be achieved.

- In Zambia the World Bank has provided a loan of almost $35-million for increased access to electricity and improved efficiency and quality of electricity distributions services. The project (P077452) started in 2008 but the World Bank says its implementation has been slower than expected and as a result the Bank and the Zambian government have agreed to restructure the project and seek additional funding. The Zambia Electricity Supply Corporation increased the number of new connections to its grid by 35 709 and reduced the number of unmetered customers to 56 558.

Hardly surprisingly, when one considers that South Africa is investing R385-billion in its own electricity generation capacity, it is the only truly electrified country on the continent. Yet South Africa is not a paragon of virtue itself, with millions of people who do not have access to basic electricity services and with a distribution infrastructure that is teetering on the brink of disaster after years and years of poor maintenance and minimal investments.

So yes, we can say that South Africa is the best of a bad lot in comparison with the rest of Africa but if we compare the country with other top-performing countries such as China, India or Australia, it's evident that we have a long way to go anyway.

As a developing country it is essential that we maintain the infrastructure that we have and, looking at the lack of skills, the difficulty of obtaining funds, the strict regulatory environment of the electricity sector and the dearth of independent power suppliers, it's clear that South Africa cannot be complacent.

It must maintain what it has rather than let it deteriorate like much of the rest of Africa.

Electronic gizmos should be off while flying

Airlines warn passengers to turn off their electronic devices and mobiles phones – particularly during take-offs and landings – and it seems these warnings need to be heeded. Researchers have found that different electronic devices could actually cause a plane to crash.

The warning is not limited to cellular phones but may embrace a plethora of other devices that use cell-phone-type technology to connect to the Internet, track positions or listen to music.

This is because many devices emit a signal, made up of electro-magnetic waves, which could potentially interfere with the plane's own electronic system. Bill Strauss, an engineer who has investigated the use of electronic items by passengers has warned that the situation is worrying for airlines worldwide.

He says that while a plane is designed to meet strict specifications and design criteria, its systems are seldom checked to ensure that they are still robust. He says that in 2003 mobile phone interference was cited as a possible reason that a charter flight crashed in Christchurch, New Zealand.

In the final report, the New Zealand Transport Accident Investigation Commission stated that the pilot's own cell phone might have caused erroneous indications of a navigational aid.

Similarly the UK's Civil Aviation Authority found that electronic interference from phones could lead to errors on instrument displays and create noise on the communication radios.

Scientists must stand up for themselves

Scientists are being subjected to shocking levels of personal vilification and distrust claims Sir Paul Nurse, the new president of the Royal Society, Britain's national academy of sciences.

He has urged scientists to fight back when criticised for the veracity of their scientific discoveries whether they link climate change with man-made carbon dioxide or refer to the benefits of genetically modified foods.

He says that scientists must not cringe in the face of criticism or hide inside ivory towers but need to speak out in defence of their findings. Nurse won a Nobel Prize for his work on cell biology and believes that scientists must get used to dealing with controversies.

He says that climate science in particular seems to have polarised public opinion especially after the leak of various e-mails from the Climatic Research Unit at the University of East Anglia, which were condemned in the media as the "greatest scientific scandal in the history of the world".

Sir Paul says that four independent inquiries have cleared the scientists involved of any scientific fraud or misconduct and have explained that the most damning quotation from one of the e-mails about a "trick" to "hide the decline" referred to nothing more than the standard procedure of splicing two sets of data together.

Benga project will start generating within two years

Australian coal producer, Riversdale Mining, and its joint-venture partner Tata Steel, will take full ownership of the $1-billion Benga power plant in the Tete province of Mozambique.

Riversdale holds 65% and Tata 35% of the shares in Benga, which is due to start generating electricity in 2013.

Riversdale says that its control of the power plant will allow development to be accelerated. Riversdale has been in talks with authorities in South Africa and Mozambique about selling electrical power to them.

Phase one of the Benga plant will see between 500 MW and 600 MW of power being generated and this will be followed by expansion, in Phase two, to get the capacity up to 2 000 MW to meet some of the electricity requirements for the Mozambique Backbone Transmission project.

Power from Phase one is to be distributed in South Africa through Eskom's existing transmission infrastructure. The power station will be fuelled from coal reserves in the Benga field, which is currently being developed and is scheduled to start producing coal later this year.

Riversdale is itself a takeover target as Rio Tinto seeks to buy its assets for $3,9-billion, which would include the stakes it holds in the Benga coalfield and in the electricity generation plant.

Dark energy – plans scuppered by lack of money

Plans to build a $1,6-billion spacecraft to investigate the mysterious force that is causing the universe to keep expanding have been postponed for ten years because of cost over-runs and mismanagement of another project, the James Webb Space Telescope.

American astronomers are dismayed by the announcement and Saul Perlmutter, an astronomer at the University of California, Berkeley, one of dark energy's discoverers, says that the US is in danger of losing its lead in fundamental physics.

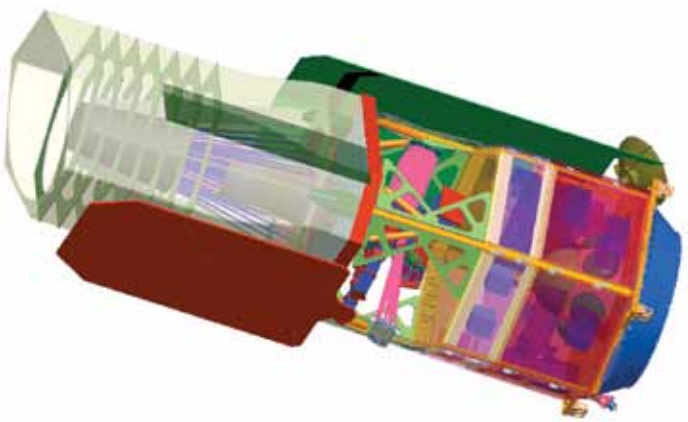
After ten years of wrangling, the National Academy of Sciences has chosen to give its blessing to a satellite telescope that will take precise measurements of dark energy and also look for planets that are beyond our solar system.

The project, with the ungainly name of WFirst (Wide-Field Infrared Survey Telescope), was ambushed by the announcement from the National Aeronautics and Space Administration that the James Webb Space Telescope, scheduled to launch in 2014, will require at least $1,6-billion and several more years to finish. The Webb telescope will search for the first stars and galaxies formed in the universe but will not be able to measure dark energy. The space agency has proposed that it buys a 20% stake in the European dark-energy mission known as Euclid.

Perlmutter says this is not a solution because if the US scientists start working with Euclid they will be unlikely to start a new dark-energy mission 15 years from now. Meanwhile, Nasa has not given the scientific community any indication of how it will raise the $1,6-billion needed to fund the Webb telescope but the agency's new budget is due to be released next month and there may be some details contained in it. Dark energy is regarded as one of the frontiers of space science. It was discovered about ten years ago and shows that the universe is speeding up in defiance of common sense or cosmic gravity and has cast doubt over the fate of the universe and life within it. Some physicists say that the explanation can be found in the fudge factor that was invented by Einstein in 1917 and called the cosmological constant.

He suggested, and quantum theory has subsequently confirmed, that empty space could exert a repulsive force, capable of blowing things apart. The calculations predict an effect of 10 to the exponent of 120 times greater than what astronomers have measured.

Astronomers who made these measurements were using Type 1A supernovae as cosmic distance markers to track the expansion rate of the universe.



Wind farms – efficiency inflated, figures wrong

Wind turbines are at least 25% less efficient than the renewable energy claims according to research from the John Muir Trust (JMT), one of Scotland's leading conservation bodies.

It has challenged the common assertion that wind farms run at an average of 30% capacity over a year. The study carried out by the Trust found that the majority of wind farms in Scotland only managed to run at 22% capacity.

Campaigners insist that these figures challenge the role of wind farms as an efficient source of renewable energy. The data was compiled from figures collected from the National Grid.

Apparently hundreds of wind farms in Scotland have secured planning permission to be built based on inaccurate and incorrect assumptions about their output.

Helen McDade, head of policy at the JMT says that the analysis proves that during the course of a year, the average load factor will be well short of what the industry claims. 'The 30% capacity claim is made at virtually every public meeting on a wind farm but these claims are not borne out by the facts," she says. For its study, the JMT examined the performance of 47 wind farms capable of producing 2 430 MW of energy. These included the Whitelee wind farm near Glasgow, with 322 turbines and the 164-turbine Crystal Rig 2 development in East Lothian.

The research found that over 395 days, the wind farms could have produced 17 586 000 MW hours of energy running at full capacity. In reality 3 881 900 MW hours were generated, equivalent to 22,07%.

Over the past two years, wind generation across the sites fell below 20 MW on 123 different days. For a total of nine days, output fell below 10 MW, barely enough to boil 3 300 household kettles.

Niall Stuart, chief executive of Scottish Renewables blamed the weather and claimed that the winter of 2009/10 was one of the calmest on record and as a result the output figures for that year were below average.

Prototype mimics plants to produce energy

Researchers working in America and Switzerland have unveiled a prototype device that mimics a plant to turn the Sun's energy into fuel.

The device uses a metal oxide called ceria to break down carbon dioxide or water into fuels that can be stored and transported.

The full findings of the research have been published in the journal Science.

The prototype uses a quartz window and cavity to concentrate sunlight into a cylinder lined with cerium oxide or ceria, which has a natural propensity to give off oxygen as it heats up and take it in as it cools down.

When water or carbon dioxide is pumped into the vessel, the ceria rapidly strips the oxygen as it cools, creating hydrogen and/or carbon monoxide.

According to the researchers, the hydrogen could be used in fuel cells in cars while the hydrogen and carbon monoxide can be used as a feedstock for fuels.

The researchers say that the breakthrough comes from being able to harness ceria's properties within the solar reactor. The metal is one of the most abundant of the rare earth minerals.

However, the researchers concede that the prototype is grossly inefficient and manages to harness between 0,7% and 0,8% of the solar energy taken into the vessel.

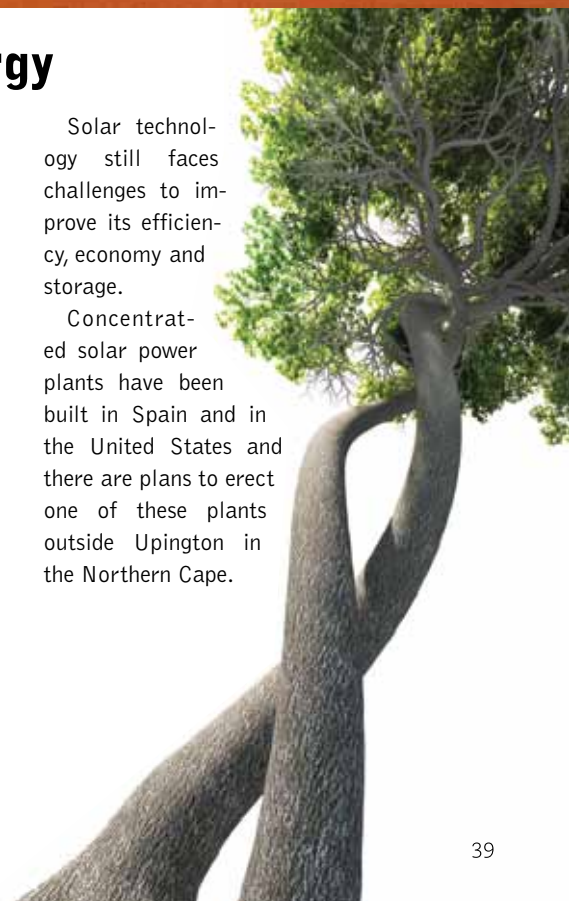
Most of the energy is lost through heat as it escapes through the vessel's walls or from the re-radiation of sunlight through the aperture used to capture it in the first place.

The researchers say that they are confident efficiency rates will climb to about 19% using better insulation and smaller apertures, and at such efficiency rates, the device might be commercially viable.

Daniel Davies, chief technology officer at Solar Century, a British photovoltaic company claims that the research is extremely exciting.

Solar technology still faces challenges to improve its efficiency, economy and storage.

Concentrated solar power plants have been built in Spain and in the United States and there are plans to erect one of these plants outside Upington in the Northern Cape.



Mentorship

The SAIEE is offering mentorship and advice to young engineers.

The offer comes at a time when our country is suffering a shortage of skills, and we believe that mentoring is an essential requirement in the training and development of the next generation of engineers.

If, as a member of SAIEE, you believe that you need a mentor you can request a mentorship service from the Institute.

The service will be of particular benefit to those young engineers working under the leadership of busy and pressurized engineers, who may not have the time to spend with the young engineers discussing and planning their career paths.

This service is particularly relevant to young engineers who are working in an environment devoid of engineers or with non technical managers. The young engineer may feel frustrated because he or she cannot benefit from the wisdom of an experienced engineer.

It will give a young engineer, the mentee, a chance to talk to a mentor, who will be his or her advisor, teacher and role model, away from the work environment. His or her mentor, matched to a similar profile, will understand the mentee's work and personal situation, having been there him- or herself.

The mentee will be able to discuss problems and frustrations with his independent mentor, who would have no stake in the outcome, and who would be able to provide an unbiased opinion and advice. The mentee might not be able to do so with his superiors, particularly if he is unhappy, and is considering an alternative career.

The mentor and mentee could arrange to meet regularly, but not too often, say a few times a year, when both should have enough time to listen properly to what the other has to say.

The mentor could recommend to the mentee what course of action to take without being too prescriptive while the final decision and the consequences remain with the mentee.

Among its more than 5000 members the SAIEE has many experienced engineers who are willing to act as mentors. They are are spread across the country and include engineers who are experienced in steelworks, furnaces, rolling mills, mining, manufacturing, electrical generation, transmission and distribution, through to light industrial, process control, instrumentation, telecommunication, robotics, automation, software development and engineering management of these sectors.

So if you feel that you would benefit by talking to a mentor, please contact Ansie Smith on the number below. She has a database to match the profiles of mentors and mentees.

Prospective SAIEE Mentors

If you feel you that you have the time and interest to help mentees, please contact Ansie Smith on smitha@saiee.org.za or 011 487 9050,

In addition you gain CPD credits, for when you are required to re-register.

Malawi to revamp its electricity sector

The Millennium Challenge Corporation, based in America, has given Malawi a $350-million grant to overhaul its energy sector and help to resolve problems with the country's erratic power supplies that are costing it about $215-million in lost revenue annually.

According to Malawi's energy department, the country had 63 days of power outages in 2009, making it one of the worst performing countries in sub-Saharan Africa.

Its installed energy capacity is just 282,5 MW compared with its estimated demand of 344 MW and only seven percent of the country's 13-million population have access to electricity. The rest rely on firewood or charcoal for energy.

Malawi is currently one of Africa's fastest growing economies as its food production levels soar thanks to a fertiliser subsidy programme introduced several years ago.

Farming output has continued to increase rapidly with figures for 2010 showing farm yields had risen by 7% up from 6,3% the previous year. Malawi remains heavily dependent on foreign aid and donors underwrite about 40% of the country's budget each year.

Billions wasted as Brits throw food away

Astonishing statistics released in Britain show that the country is producing the equivalent of 10 Wembley stadiums full of rubbish every year. This means that millions of tons of food are being buried or burned each day because councils have failed to meet recommendations on dealing with biodegradable rubbish.

The picture in South Africa is little better where there are only a few renewable energy projects that use rubbish as a feedstock to generate power.

According to a survey conducted by British newspaper, The Independent on Sunday, local authorities are pushing food waste into landfill sites rather than using it to generate power.

Moreover, there is growing opposition to the use of incinerators at dump-sites around the country. The councils are wrestling with ways to dispose of this enormous amount of wasted food.

In terms of guidelines issued by the European Union, all countries are supposed to introduce ways to prevent wastage and that a priority should be to use rubbish dumps as a means to generate electricity.

Wrap, the government-funded waste reduction adviser says that British households throw away about 8,3-million tons of food and drink, worth about £12-billion, every year. Councils in Wales collect food separately from other rubbish but other countries in the UK do not do so.

Michael Warhurst, an executive at Friends of the Earth says that the government should force councils to collect food waste separately and should use this wasted food to generate electricity or to make compost.

The councils argue that the costs of introducing measures to collect food waste separately from other waste are prohibitive. Only 41% of the 300 councils in the UK actually collect food waste separately from other waste but many of them fail to recycle the food waste.

The Isle of Wight is one council that does do so and it sends food waste to its gasification plant where it is used to generate electricity.

A Wrap report produced last year showed that anaerobic digestion is the preferable option for dealing with food waste as it produces a methane-rich biogas that can be used to generate electricity.

There are currently 37 anaerobic digester plants in the UK and there are plans to build another 60. Every ton of food waste put through an anaerobic digester saves a ton of carbon dioxide emissions.

A £145-million energy-from-waste facility is due to be built at North Hykeham and will start generating power in 2013.

Watt's Says

Hi Paddy,

I read with interest your comments on the "Cosatu pipedream" in Wattnow November 2010 . Your comments are correct but after reading your Editorial and the article a second time I realised that I find no reference to the positive contribution Cosatu makes to the work of Professional Engineers. It is not understood by Cosatu that they could be pricing labour out of the manufacturing industry. No manufacturer / business man will allow his business to be priced out of the market by external factors, if certain input costs rise to the point where it will price the products out of the market. Other manufacturing techniques will be switched to. Replacing labour by the design of machines is not new. In 1812 for example each spinner operating a Hargreave's "spinning jenney" replaced 200 workers. History has recorded the riots, but the textile industry did not revert back to the spinning wheel, it moved on .

Another good example is the wheat farming business. Many centuries ago the wheat was harvested using sickles but this is very labour intensive and the scythe was invented to increase productivity. Eventually that was replaced by the present range of wheat reaping and threshing machines used today. Grape picking was, until recently, a labour intensive operation but farmers struggle to find the labour and pay the wages demanded, with the result that farmers have started converting their vines to facilitate mechanical harvesting which means that manual grape picking is becoming a thing of the past.

The car manufacturing industry has also replaced workers in areas such as welding, painting, grinding and cutting to save costs and improve efficiency.

"Cosatu's pipedream" if implemented would result in calls from industry to the engineering profession to design alternate manufacturing methods. There is more work for the engineers and we must thank Cosatu for it.

Hans Nieuwmeyer

Hi Paddy,

I have just read your article 'SA attitudes must change' in Mar 2010 issue of WATTnow - brilliant!

You have identified the most important issue facing not only SA, but the rest of Africa and many other countries - lack of maintenance.

Not that I am a maintenance or production engineer, in fact I am a project eng having been involved in new capital projects all my life.

You could typify me as typical of the silent majority, never having sent a letter to a newspaper or commented on an article in any magazine. So you can rightly feel honoured. Your article is the first I have ever commented upon, and I do read an awful lot and wide variety of topics, and have many times felt the urge to send in a reply. The reason for the late reply is due to the fact that I only received the Mar & Apr issues yesterday, having received the May issue 2 weeks ago.

I have been working in Qatar for many years now and it typically takes post 3-6mnths to arrive here. The local letters from Qatar we receive promptly, but from overseas it takes long, somehow I think the problem lies here. Somewhere at one of the many state bureaucracies, staffed by locals who typically have work hours from 8-12 or 8-1, but do very little work in that time, the post heaps up for months and then gets cleared out once in a while it seems (probably when they get a poor Nepalese or Indian in to clean up the office).

Qatar has money pouring in from oil & gas revenues and much of it gets wasted on big projects where most of the work gets done twice, once to do a shoddy job and the second time around to fix it with another shoddy job.

No new road has a 100m stretch that is without damage of one form or another. Big high rise buildings with impressive glass facades and design have no parking bays and the pavement outside is usually in a terrible state. Have a look close up and you will see the bad workmanship. When something doesn't work, it gets replaced by a new unit – forget maintenance. Often a new road is built and 2 yrs later it gets ripped up for a bigger wider road or to install sewerage pipes or power cables that were not installed due to bad planning, or more correctly, no planning or foresight whatsoever.

To summarise, here in Qatar the attitude is – do not worry, the state has plenty of money to pay again for a 2nd time. Forget about planning ahead or maintenance, in a few yrs it will be replaced in any case. So why do a good job that will last for 20yrs since it will be replaced/broken down/dug up in the next 5 yrs, or a more modern piece of equipment will be available allowing the "old" one to be chucked out and replaced by the latest model. In any case, that means more jobs for more people.

So whereas SA do not have the money, here they have too much money, but attitudes are even worse because of that!

I enjoy your magazine more than the old Elektron, being much more readable AND LESS HIGHLY TECHNICAL with content on day to day issues and new products such as cell phones, the environment or internet etc. I always find articles that the kids and wife must read as well and they also find them interesting and readable!

Finally, what I particularly like about your other articles in WATTnow is the 'no nonsense tone' and that you speak up and address the real problem issues and underlying causes in SA (eg Transnet Logistics issue in Mar'10 issue). It is high time someone has the guts to address issues usually not talked about due to being politically sensitive/"in staatsbelang/landsveiligheid" or that it may offend some races/big institutions/companies/political parties/ people etc etc. If it is a problem, talk about it!! By not bringing it out into the open and addressing it will not bring solutions or make it go away, it will get bigger and more problematic.

Enjoy spring in SA
Hennie Lourens

Dear Paddy,

First of all, let me offer my sincere congratulations for your prestigious award! I must confirm that you are still an unwavering promoter of the engineering profession despite the uphill battles that engineers are facing. I am also grateful that you were willing to publish my letter about the great joys and pitfalls when choosing an engineering career. After retirement I remained in teaching and research for a while, but heard the clarion call of the future. I have therefore undertaken a second albeit unpaid, but thoroughly enjoyable, degreed study in human physiology, biochemistry, pharmacology and molecular genetics.

As someone said, the 19th century belonged to chemistry, the 20th to physics and engineering, while the 21st is increasingly dominated by biology, as also attested to by the several recently published articles in WATTNOW. What attracted me to these studies? The countless surprising and quite astounding analogies between industrial control engineering processes and physiological control processes. In jest, I used to say that I used to practise "industrial homeostasis".Of course, it is a quite different world and it was not easy to switch from engineering, where experimental and design outcomes can be mathematically predicted or at least estimated, to biology, where enormous amounts of data must be memorized. Experiments require trial-and-error methods and experimental research techniques require many years of practical learning. Yet one gains an insight into medical science and health issues, understands diseases, medication and blood tests, can meaningfully work with your physicians (that is, with those willing to cooperate), and know your body better. As a subject of lifelong learning, I would recommend it to retired electronic and industrial control engineers.

Regards,
Prof.Ian Shaw,PrEng

Dear Paddy,

I have just returned from Perth and am catching up on mail etc. In my son's latest Wattnow we have {September 2010,} there is an article on Green Buildings. My brother-in-law has nine solar panels each about 1m x 1m square on his roof. These feed power into an inverter {?} which then provides AC current for his use. But power not used is fed into the local mains and the council pays him for his outlay. Do we have anything similar in South Africa, and if so where is it available from?

Regards,
Jim Begley

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Natural gas – is it a threat to SA and the world?

The head of the International Energy Agency (IEA), Fatih Birol, is shouting his global warming warnings to all corners of the world and yet it seems most of his efforts are going unheeded.

As America recovers from its economic turmoil, China returns to its enormous productivity levels and the oil economies consider boosting production as oil climbs to $100-a-barrel, world leaders seem to have forgotten their undertaking to reduce emissions.

At least that's what Birol believes and in speeches in London and Abu Dhabi in January he warned that efforts to limit global emissions are already faltering. He is the latest high-level figure in international energy circles to warn that pledges to cut emissions made under the Copenhagen Accord won't stop global temperatures from rising.

As an economist, Birol points to the unflagging demand for oil and other fossil fuels and the tepid investments that are being made in zero-emissions energy projects.

He says that if world leaders want to prevent temperatures from rising by more than two degrees then decarbonisation efforts need to increase by about 400%. He says that although the focus should be on energy economics electricity utilities are geared towards providing a cheap source of energy.

He says a boom in natural gas development in the United States has dampened investments in renewable energy because natural gas is a cheap means of generating electricity and there is plenty of it too.

Birol says that if natural gas remains cheap and plentiful – as it is now – then that alone will limit investment in renewable sources of energy such as wind and solar power.

There has been a resurgence in natural gas exploration around the world and here in South Africa. Shell has announced plans to explore about 30 000 square kilometres in the water-stressed Karoo.

The exploration method will use hydraulic fracturing or 'fracking' and involves drilling boreholes that are between 4 000 and 5 000 metres deep and then pumping a mixture of chemicals, sand and water into the boreholes at extremely high pressures.

This causes the rocks beneath the ground to fracture so that shale, or natural gas can flow to the surface. The method determines if sufficient quantities of gas are available and can be exploited.

Already, an opposition group consisting of farmers and non-governmental organisations have grouped together in an effort to prevent Shell from using this method of exploration. Another company, Advasol has plans to explore the region from Struisbaai to Mossel Bay and 20 km inland along the southern Cape coastline.

According to Fritz Bekker, a farmer and spokesman for the group opposed to the exploration plans, fracking has been condemned and outlawed in many countries around the world.

Bekker says that fracking in the Karoo will lead to possible chemical contamination of the limited ground water resources there and the long-term effects of the chemicals used during the fracking process have been positively linked to cancer, asthma, diabetes, Alzheimer's and Parkinsons diseases.

Meanwhile Shell has appointed Golder Associates to compile an environmental management plan and to handle the public consultation processes that are required ahead of the exploration work.

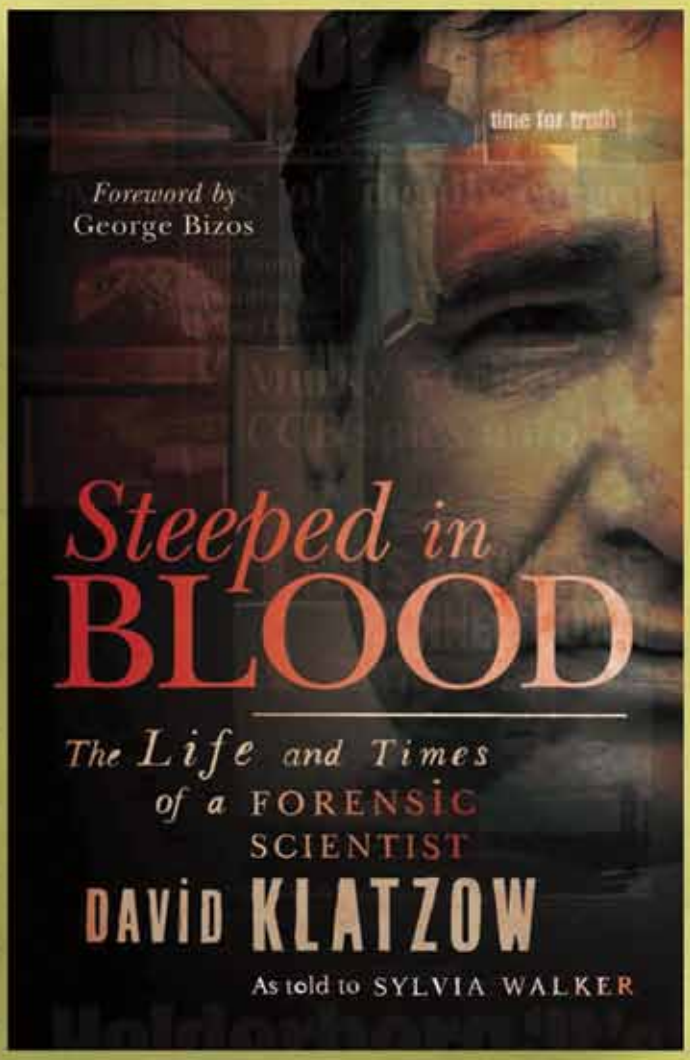
Shell has also submitted its application for a permit to explore the Karoo to the Petroleum Agency South Africa, which administers all exploration permits on behalf of the Department of Energy.

Shell says it plans to do some fieldwork in selected areas of the Karoo and will do a number of desktop studies based on data it collects.

There appears to be some confusion of the public consultation aspects of the project. Shell and Golder arranged a meeting in Hofmeyer for the third week of January but then apparently omitted to mention this to the president of Agri Eastern Cape, Ernest Pringle, who says he was not contacted at all even though he farms in the affected area. Ed Kingwill, chairman of the Rooihoogte Farmers' Association in Middelburg, also says that he was not told of the meeting.

In fact, the regional chief director of the Department of Water Affairs was not notified and neither was the Nama Karoo Foundation, a conservation agency working to protect and preserve the cultural and natural heritage of the Karoo. It is based in Richmond and Graaff-Reinet.

Shell has not said when it intends to start exploration of the Karoo region but it seems that it will first have to persuade farmers, environmental organisations, geologists and water specialists that the methods it intends using to search for natural gas will not harm the region.



Steeped in Blood – The life and times of a forensic scientist

Bloody crimes of passion, political assassinations, sinister poisonings, investment fraud and mass mining disasters ... Dr David Klatzow has seen it all. During his extraordinary twenty-six-year career as South Africa's foremost independent forensic scientist, he has investigated countless high-profile and notorious cases.

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AVAILABLE: OCTOBER 2010

This book exposes a demanding and sinister world where the rewards are equalled only by the frustrations, and where the truth is always elusive. But the truth is out there, and David Klatzow will find it.

About the Author - David Klatzow

Dr David Klatzow is an internationally recognised forensic scientist. He is an expert in the field of pyroforensics and an authority on blood alcohol. Before branching out into the world of forensic science, he was a lecturer in biochemistry at the University of Durban-Westville and medical biochemistry at the University of the Witwatersrand.

About the Author - Sylvia Walker

Sylvia Walker is a marketing manager in the financial services industry with a passion for writing and a keen interest in the world of crime. Her first book, Dealing in Death, was published in 2009 and focuses on tik and the plight of parents who live with addiction.

• ISBN: 9781868729227 • Format: Softcover

George Airport navigation systems

A VISIT and presentation of the George Airport navigation systems was held as part of an OGM of the Southern Cape Centre (SCC) in September last year.

Held in the main lecture room of the Flight Training College, adjacent to the George Airport, Hendrik Hubbard of ATNS gave a comprehensive and interesting overview of the workings of the various navigation and telecommunication systems associated with the airport.

He described the many project challenges and technical issues that have had to be overcome to provide the reliable and effective systems that most people take for granted.

This was followed by a visit to the recently completed secondary radar system just outside the airport perimeter near the N2. Here members were able to wind their way up the steel stairway inside the concrete tower to reach the equipment room near the top.

The 40 m concrete radar tower from below.

Steel stairway inside.

Antenna motor, gearbox, RF and power cables.

Breathtaking view over the airport.

Radar equipment installation.

Hendrik Hubbard explaining the intricacies of the secondary radar – Alton Lock peering at the synthetic display.

2010 SAIEE Committee

As of 2009 the UCT student branch became a joint IEEE and SAIEE student branch. This means that the student branch became known as the UCT IEEE and SAIEE student branch. The student branch has a Counsellor (Dr Azeem Khan) and a Mentor (Professor Mqhele Dlodlo).

Student membership only picked up in 2010 when 30+ members registered for SAIEE membership (IEEE student membership was at 200+) but this number is expected to increase in 2011. In 2010 SAIEE sponsored events were:

- Trip to Ankelig Power Station, where 12 students attended a field trip organized by the SAIEE Western Cape Chapter
- Presidential Visit – SAIEE President Dr Angus Hay visited the student branch and gave his presidential address to staff and students on 28 April 2010. 70+ student attendees
- Distinguished Lecturers' Seminar 26 May – SAIEE sponsored the talk by IEEE Distinguished Lecturer, Prof V. J. Bargavha. 50+ staff and student attandees
- MTN Science centre outreach – Members of the student branch participated in the SAIEE Western Cape Chapter series of events where school learners participated in visits to the MTN science centre to learn more about EE disciplines in efforts to encourage further studies at higher education levels. 8 student members assisted
- PES Student Chapter Launch: Talks by Alan Rotz 11 Aug. The SAIEE co-sponsored the function where a Power and Energy Society student chapter at the University of Cape Town student branch was established. 60+ student and staff members attendees

For further information visit www.ieee.uct.ac.za

Denis Wang (Vice-Chair), Benson Chan, Eric Chen, Milton, Joyce and Ragesh Pillai (Chair).

TELECOMMUNICATIONS RESEARCH GROUP

POWER LINE COMMUNICATIONS:
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Our Research Interests

Powerline Communications
Digital Communications
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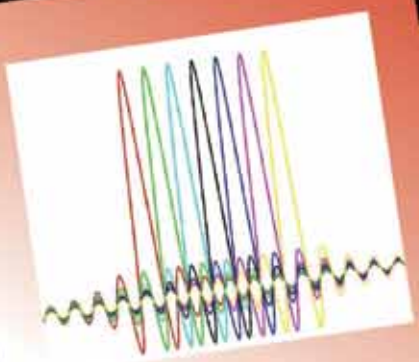

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