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Official Magazine of

SAIEE

January 2010

Nersa, Eskom and electricity theft

Within the next couple of weeks we will all know how much more we will have to pay for our electricity. What's more, any ruling made by the National Energy Regulator of South Africa (Nersa) will prompt anger and derision.

You see, if the tariff hike is approved unchanged, industry and South Africa's consumers will rebel. If Eskom doesn't get its increases it will probably halt, mothball or delay future generation plans, jeopardising future growth and development in this country.

So, whatever ruling Nersa does make there will be dissatisfaction.

However, I do believe that Nersa and Eskom are wasting a lot time and energy trying to resolve only a part of the problem: the cost of electricity. There's no doubt that any electricity price increase has – and always has had – a knock-on effect for the rest of the economy and for society as a whole.

Perhaps, too, if the electricity prices are so high as to be almost unaffordable then consumers may stop wasting as much electricity as they do. A nice notion but one that, in practice, seldom works.

I personally don't believe that we will see any significant changes in electricity consumption once the initial impact of higher prices have filtered through to the whole economy. And that is rather alarming because it seems to indicate that South Africans are – and will remain – rather cavalier about their energy consumption.

Sure, if demand-side management systems are put in place and consumers don't really have to think about switching off a geyser, a television set or a swimming pool pump, then we might see greater energy efficiency. Without such technology there will be little, if any, change in electricity usage.

But much more worrying for me is the reality that electricity theft is increasing rapidly in all municipal regions in South Africa. And electricity theft is something that Eskom, Nersa and the South African Police Service are just ignoring.

In fact, organisations that intentionally break the law (such as the Soweto Electricity Crisis Committee) are allowed to continue illegally reconnecting electricity services without fear of prosecution.

The fact that theft levels are equivalent to the total output of, say Camden Power Station, seems to be of little interest to Eskom, the South African Police Service or Nersa. And of course, as soon as the price of electricity rises, as it will later this year, there is bound to be a corresponding spike in electricity thefts.

That is the irony: charge more for something and more people will steal it. It's the South African way: when something becomes too expensive, steal it instead. As car prices rise, car thefts and hijackings rise; as jewellery prices peak, robberies at jewellery stores go up. If the petrol price rises, motorists steal more petrol.

And yet none of the authorities in South Africa are actively trying to stamp out something as simple as electricity theft. Consumers happily pay for an illegal electricity supply, just as they 'gypo' the meters to reduce consumption. And nobody does anything about it.

There's a whole supply chain involved in stealing South Africa's power: electricians, technicians, even neighbourhood organisations, power cable thieves, scrap metal merchants and so on. All making a living out of stealing part of South Africa's most essential infrastructure – its energy supplies.

And this is where I believe Nersa, Eskom and all other interested parties should focus their attention.

You see, each and every one of those organisations should be working on ways to prevent electricity theft so that they can literally pull the plug on those people and organisations that are not paying for the electricity they use.

And, I include such organisations as BHP Billiton and its aluminium smelters and Robert Mugabe's thugs in Zimbabwe who take our power and don't pay for it. And any other industrial or mining operation that pays less than the prevailing rate for electricity generated for South Africa.

Because in truth these people are actually stealing electricity from all of us. That is something that Nersa, Eskom, SAPS, the Department of Energy and any other one of the interested parties should be addressing.

It's really quite simple: stop electricity theft and you can also stop building some new power stations.

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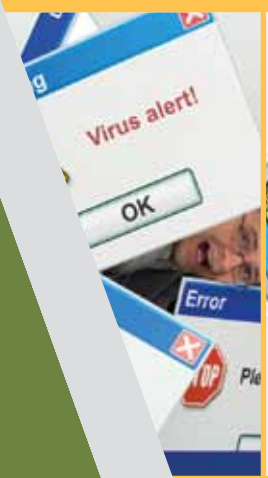

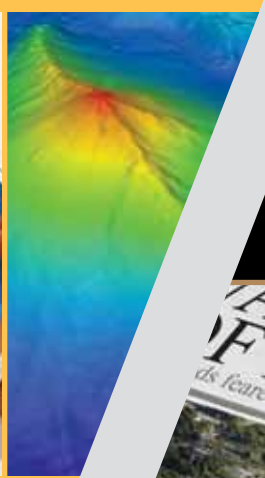

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Boeing's Dreamliner takes to the skies

Boeing's new 787 Dreamliner passenger aircraft has completed its first test flight at Boeing Field in Everett north of Seattle more than two-and-a-half years later than originally planned. Design and manufacturing problems have delayed delivery of the new plane.

The Dreamliner claims to be one of the world's most fuel-efficient passenger aircraft.

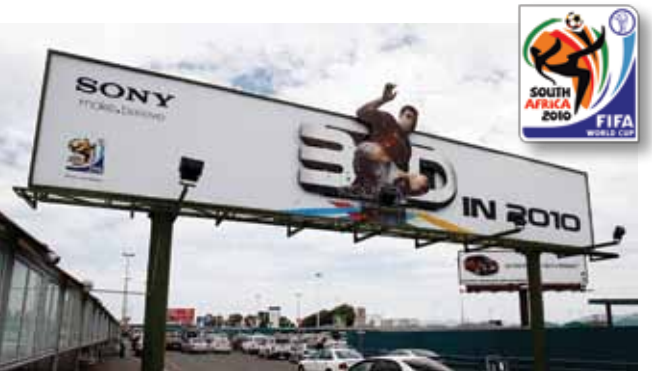
According to test pilot Randy Neville, the tests included lowering and lifting the landing gear and adjusting the flaps on the wings and he says that the plane responded exactly as was expected, making it a joy to fly.

Several hundred Boeing employees, industry guests, aircraft enthusiasts and journalists attended the inaugural flight and cheered loudly as the large plane, painted in blue and white, lifted off from the cold, damp airfield in the United States.

At least 840 orders for the 787 Dreamliner have been received, worth about $140-billion for Boeing. The company is hoping to deliver the first Dreamliner models by the end of this year.

About 80 percent of the aircraft is made from composite materials that include 35 tons of carbon-fibre reinforced plastic. Its arch rival, the Airbus A380 can carry considerably more passengers but it is limited to using airports that can handle the double-decker aircraft.

The 787 is Boeing's first all-new jet since 1995. Parts of the wing and fuselage were made in Japan, Italy and in other parts of the US and this provided logistics and transportation difficulties for the company, which contributed to the delivery delays.



World Cup in 3D for viewers everywhere

Sony, as one of the official sponsors of FIFA's 2010 World Cup, has reached an agreement with the organisers to produce the world's first three-dimensional transmission of the event.

Sony's 3D cameras, its technology and products will be used to beam three-dimensional images to viewers around the world.

Sony says that at least 25 games will be broadcast in high definition 3D providing unprecedented depth, vividness and excitement for the millions of soccer lovers around the world.

Sony is already incorporating its 3D compatibility into a wide range of its consumer products including the new LCD televisions sets, the Blu-ray disc recorders and players, the Vaio computer range and the PlayStation 3.

According to Sir Howard Stringer, chairman, chief executive and president of Sony, the transition to 3D television is now underway.

He claims that the company intends to maintain its leadership in bringing this technology into the homes of millions of people around the world.

He says that the 3D experience means that viewers will feel as though they are actually sitting inside the stadium experiencing the event in real life.

Various international *FIFA Fan Fests* are planned for Berlin, London, Mexico City, Paris, Rio de Janeiro, Rome and Sydney.

Sony will release an official 3D film on Blu-Ray discs and in other formats after the event.

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Higher acidity in oceans may threaten fresh fish supplies

The world's oceans are all starting to acidify, posing major threats to marine life and to the food supply chain according to Hilary Benn, Britain's Environmental Secretary.

The cause of the increased acidity is attributed to the fact that more carbon dioxide is being absorbed from the air.

Statistics compiled in the UK indicate that up to 50 percent of the carbon dioxide released by burning fossil fuels over the past 150 years has been absorbed by the world's oceans, lowering the pH value by 0,1.

Liquids of a pH of nil are very acidic while those with a pH of 14 are very alkaline. The neutral measure is seven.

Seawater usually has a pH of about 8,2 but because of the high carbon dioxide absorption, the level is changing.

Absorbed carbon dioxide in seawater forms carbonic acid and lowers the ocean's pH, making it more acidic.

Benn says that more than a billion people in the world depend on fish for their principal source of protein and the higher acidity in the oceans could see fish dying off rapidly.

He was addressing delegates at an Oceans Day summit organised by Stanford University and the Scripps Institution of Oceanography, both based in California.

CEF set to cut greenhouse gas emissions

The Agence Française de Développement (AFD), the French arm for international co-operation, provided a grant of R1 568-million to Central Energy Fund (CEF) to help finance its Carbon Capture Storage (CCS) Centre.

According to AFD's chief executive Jean-Michel Severino this partnership with the CEF is significant and important during the current energy crisis in the country. The CCS will be undertaken by the South African Energy Research Institute, a subsidiary of CEF. It will be one of the country's most promising measures for climate change mitigation.

CCS is currently the only technology available to reduce greenhouse gas emissions from fossil fuels used to generate electrical power. The partnership between AFD and CEF began in 2007 with the launch of a R7,2-million project to increase energy efficiency and renewable energies in South Africa. The objective was to reduce the dependence on fossil fuels and carbon dioxide emissions.

Severino says that AFD has been able to make a contribution to SA's national energy efficiency strategy by providing technical assistance to CEF's Energy Development Corporation (EDC) – and subsidiaries, National Energy Efficiency Agency (NEEA) and South African National Energy Research Institute (SANERI).

These organisations have played an important role in implementing policies regarding energy efficiency and renewable energy, says Severino.

The AFD, in partnership in CEF, has been involved in a number of other projects including:

- The solar water heater project in the Nelson Mandela Metropolitan Municipality and eKurhuleni Municipality
- CEF's landfill gas portfolio across four municipalities to offset carbon emissions
- An energy efficiency project in SA universities

CEF is responsible for searching for appropriate energy solutions to meet the future energy demands in SA, SADC and the sub-Saharan African region. These include oil, gas, electrical power, solar energy, low-smoke fuels, biomass, wind and renewable energy sources.

The announcement between AFD and CEF was made during Severino's four-day visit to SA where he committed R3,5-billion to Desmond Tutu HIV Foundation, Global Rating, the National Housing Finance Corporation, the Development Bank of Southern Africa, and Transnet.

UCT toolkit gives small business access to e-commerce

An innovative project at the University of Cape Town aims to help small African organisations to set themselves up for e-commerce at minimal cost – and has proven so effective that IBM has rewarded the originator of the project, UCT head of Information Systems, Professor Jean-Paul van Belle, with a prestigious and highly competitive IBM Faculty Award.

Funding from IBM of more than R162 000 will enable UCT to create an Information and Communication Technologies (ICT) resource toolkit aimed at assisting small African organisations to assess their readiness for e-Commerce with a self-assessment test. Once an organisation has assessed its maturity and decided which ICT areas to target, a set of resources will assist it to implement the changes.

These include how-to guides, checklists and other self-help materials customised for Africa. The toolkit will be free on-line as well as on CD or DVD. The project has already been proto-typed, thanks to seed funding from NGOConnectAfrica.

Acting Dean of the Faculty of Commerce, Professor Mike Wormald, said: "We believe this will not only increase the efficiency and effectiveness of organisations, but also help SMMEs and NGOs to leap over the digital divide using mobile internet access, customer relationship management, digital storytelling and open source platforms. We are delighted that we have garnered this award from a pool of literally thousands of applicants worldwide. This reflects that UCT is on a par with other innovative global universities competing for the IBM Faculty Award, including Harvard and the Massachusetts Institute of Technology."

Professor Van Belle said currently many small businesses in Africa were not yet using ICTs effectively, due to lack of know-how in an accessible format, absence of skills, internet access, remote location, institutional barriers, vendor bias and software costs.

"Bridging the knowledge and resource gaps may narrow the digital divide and also indirectly grow local economies through increased productivity," he said. "There will also be an important feedback loop to larger IT organisations, such as IBM, sensitising them to the needs and challenges of small organisations in the developing world, opening up engagement with this market."

Head of IBM University Relations for sub-Saharan Africa, Sean McLean, says the IBM Faculty Awards form part of a number of the company's academic initiatives including IBM Shared University Research Awards, IBM PhD Fellowship Programme and IBM Innovation Awards, which are aimed at fostering the development of curricula relevant to the creation of ICT skills.

IBM says that over the next few years, there will be a number of innovative systems for industries to control carbon emissions, track food moving through the global supply chain, capture and deliver solar and wind energy and improve the quality of health care. These innovations will increase the demand for the corresponding business and technology skills implying that today's students will have to develop a range of new, innovative skills.

This is one of the reasons that IBM is currently working closely with industry and academia to develop smarter skills that will prepare students for the jobs of tomorrow. These new skills combine critical thinking, creativity, and innovation with leadership, global awareness, and technology literacy.

IBM encourages university innovation through a variety of outreach initiatives that range from technology education, student projects to curriculum enhancement and collaborative research. This is supported by vibrant and sustained interaction with students and academia using IBM academia collaboration platform where academia, students and IBMers come together to discuss, share, build knowledge and future directions leading to innovations for future.

IBM University Awards support basic research, curriculum innovation, and educational assistance in focus technology areas, which are fundamental to innovation in the 21st Century and strategic to IBM's core business. The IBM Faculty Award Programme is a competitive worldwide programme intended to foster collaboration between researchers at leading universities worldwide and IBM research, development and services organisations. The award promotes courseware and curriculum innovation to stimulate growth in disciplines and geographies that are strategic to IBM.

These awards, which are typically cash grants, are not contracts and no intellectual property rights are stipulated as part of a Faculty Award. IBM strongly encourages these innovations to be placed in the public domain.

Over the past three years. a number of universities across the subcontinent (Uganda, Kenya, Ethiopia, Tanzania and South Africa) have submitted proposals and have been successful in receiving a Faculty Award. To receive a Faculty Award, candidates must be nominated by an IBM employee with common interests who will serve as a liaison for the collaboration.

Some of the leading scientific discoveries of the decade

Leading scientists in Britain – and in other parts of the world too – were asked by the British Broadcasting Corporation to rate what they considered to be some of the most significant scientific projects undertaken in the first ten years of the 21st Century.

Professor Chris Stringer, the research leader in human origins at London's Natural History Museum says that the discovery of the controversial, human-like skeleton found in the Liang Bua Cave on Flores must rank as one of the most significant discoveries of the decade.

The skeleton was found on an island 500 kilometres beyond the known range of ancient humans in South East Asia and dating evidence suggests that these early humans were living there only 18 000 years ago.

He says the skeleton displayed a remarkable combination of features: it was adult but stood only about a metre tall and its skull indicated that the brain was about the same size as that of a chimpanzee. The skeleton, dubbed *Homo floresiensis* is more commonly called *The Hobbit* because of its small stature.

Dr Tim Hubbard, head of informatics at Britain's Wellcome Trust Sanger Institute says the mapping of the human genome was a great achievement for scientists and researchers throughout the world.

He says this feat opened up new and unexpected directions for research into better medical treatment but there is still much work to be done because so far just one million points – out of a three-billion-letter human genome – have been checked.

Hubbard says that in the next decade we can look forward to treating diseases such as cancer through sequencing analysis of the individual's genome and this will become part of the diagnosis and lead to much more personalised methods of treatment.

Dr Michele Dougherty, professor of space physics at Imperial College London, says that the magnetic field instrument used on the Cassini spacecraft is one of the most significant discoveries for astronomers around the world.

She and her team designed the magnetic field instrument used on Cassini and its most important discovery so far is the dynamic atmosphere of one of Saturn's small moons, Enceladus.

The instrument revealed out-gasing of water vapour on Enceladus and the magnetic field data led the researchers to conclude that Enceladus had an atmosphere made up of water vapour constituents and these were acting as an obstacle to plasma flow.

Dr Richard Massey, a fellow in astronomy at the Royal Observatory in Edinburgh believes that the work done in the past ten years will help scientists understand dark matter, believed to be the most common 'stuff' in the Universe.

Massey says that billions of dark matter particles whizz through the outstretched hand every second. In 1933 astronomer Fritz Zwicky noticed that most of the galaxies' mass is invisible and suggested it could be mapped via gravitational lensing or bending light around anything heavy.

Gravitational lensing has been measured by the Hubble telescope, revealing invisible tendrils of dark matter around and between every galaxy.

The sensational Large Hadron Collider (LHC) is set to make the fastest collisions of particles ever witnessed in a laboratory and it is thought that these collisions might create a few particles of dark matter that can be studied by scientists in the decades ahead. The LHC is undoubtedly another of the great scientific achievements of the past ten years and its particle detectors will explore the collisions between two beams of protons at energies up to seven times higher than ever reached in a laboratory before.

Meanwhile, Dr Ron O'Dor, senior scientist at the Census of Marine Life says that the unprecedented global programme has already discovered many new habitats and species in the Earth's oceans.

In the 1990s, a panel representing the United States National Research Council reported that no nation in the world had a catalogue of the life in its marine zones.

To rectify this the Alfred P Sloan Foundation agreed to fund the decade-long Census of Marine Life.

It evolved into a $750-million programme involving scientists from 82 different countries with researchers sampling the seas from the Arctic to the Antarctic.

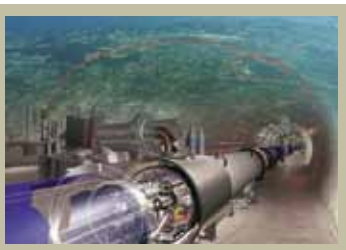
The database now provides data on over 20-million species in the waters of all nations and in the deep-sea regions. Joyce Tait, a professor at Edinburgh University's Chair of the Nuffield Council on Bioethics' Working Party on Biofuel, says that research undertaken in the past decade has made it possible to produce a new and improved generation of sustainable fuels.

She says that biofuels derived from micro-organisms, plant or animal material, were pioneered in the early days of the automobile.

First generation biofuels were made from food crops such as corn but Tait says that research is now directed at making biofuels from biotechnology processes including algae.

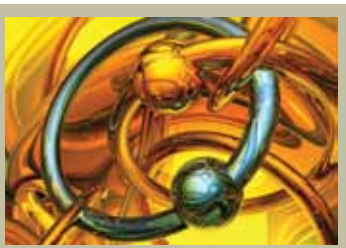
Floresiensis cranium compared to that of a modern human.

Credit: NASA/JPL/ Space Science Institute.



Artist's impression of the Large Hadron Collider.

Census of Marine Life database with more than 20 million species' data.



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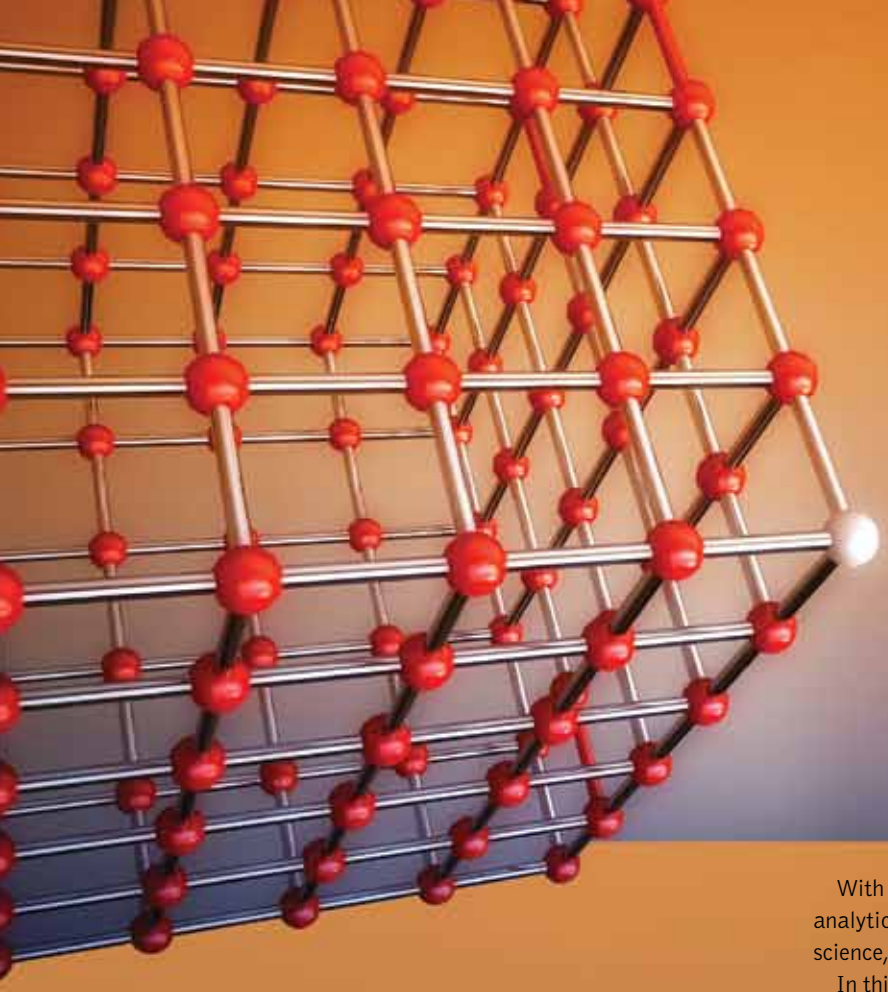

Nano-technology or bricklaying with atoms?

By Dr Kelvin Kemm

Nano-technology is a term that is heard frequently these days, but few people know what it actually means as it is usually used as a term within the context of biology, physics or electronic circuitry.

Most people do know that nano-technology means 'very small technology' and in the most simple terms can be thought of as 'bricklaying with atoms.' The prefix 'nano' comes from the normal metric prefix sequence of milli, micro, nano, pico, and so on, in which each prefix is a thousand times smaller than the one before it.

Over the last few decades the world became familiar with the term 'micro' and we heard of 'microscopically small,' micro-grooves or various other 'small' measurements of the era.

However, in the realm of nano-technology what happened historically is that, over centuries, scientists probed deeper into the smaller regions of life and developed microscopes that could resolve smaller and smaller structures.

Any optical resolution of the microscope is limited by the wavelength of light used, and also by other design and construction factors. Blue light gives a better resolution than white light because, in the visible spectrum, blue light has a shorter wavelength.

In later years, in parallel to this probing from the 'top-down', scientists started probing from the 'bottom-up', so to speak. Techniques such as x-ray crystallography were developed, which allowed science to effectively 'see' the planes of atoms that formed a larger structure. X-ray methods allowed us to determine the actual structures of molecules, one of the most famous being DNA.

However, these top-down and bottom-up approaches left a gap in between, too small for the top-down to see, and too large for the atomic bottom-up techniques to show the tiny structures that lay hidden in the mystery size band, which has now become known as the nano-technology band.

With the advent of electron microscopes and other advanced analytical devices and techniques the nano-band became assessible to science, and with this accessibility came great interest.

In this nano realm, nature has developed many physics technologies that are now of great fascination. Such technologies include the hair on a gecko's feet, which enables it to walk upside down on a ceiling; or the small tubes on a butterfly's wings, which give the *Morpho rhetenor* butterfly a bright blue shimmer in the sunlight; or how the hypodermic sting of a jellyfish works.

In electronics it has been found that many, very tiny electronics roadways can be created in a silicon chip to produce a chip that contains an entire electronic device, but which can still sit on a person's fingernail. Producing these electronic pathways, using nano-technology, is more akin to 'growing' them rather than 'forming' them, as was the case in the past.

In fact, even in the nano-technology area of biology the techniques are closely aligned to physics processes because biological nano-technology processes, like genetic engineering, are actually a case of working at a molecular level, the size level generally thought of as being smaller than a living organism, and so rather closer to the realm of basic physics and chemistry.

What this means is that the nano-technology door of opportunity has opened and there are vast treasures that nano-technology will unlock in the years ahead.

A dramatic recent example has been the development of the photonic crystal, a nano-structured crystal that enables light to be guided through a crystal to create pathways in which information can be stored and manipulated.

The photonic crystal was predicted by physics, as a theoretical possibility, in 1987. Such a crystal was first created in 1991, but then photonic crystals were discovered in nature in butterflies and marine creatures in the late 1990s.

The *Morpho* butterfly uses this technique to produce its iridescence, emitting flashes of blue light that can be seen from hundreds of metres

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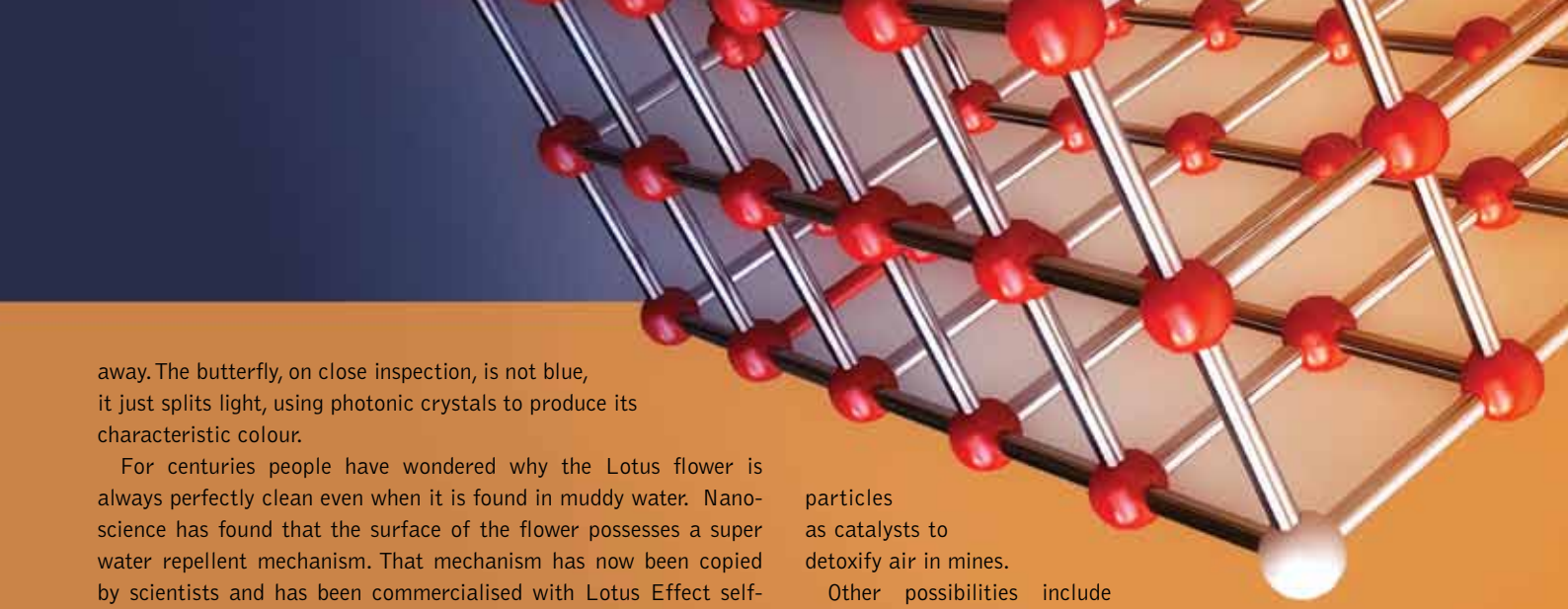


away. The butterfly, on close inspection, is not blue, it just splits light, using photonic crystals to produce its characteristic colour.

For centuries people have wondered why the Lotus flower is always perfectly clean even when it is found in muddy water. Nano-science has found that the surface of the flower possesses a super water repellent mechanism. That mechanism has now been copied by scientists and has been commercialised with Lotus Effect self-cleaning window panes and paint.

The nano-sized structures discovered in nature were part of the inspiration for modern science to replicate these structures for modern commercial use. The other part of the inspiration was the natural progression of knowledge that caused scientists to start 'bricklaying with atoms' to produce very small and efficient structures that could be used in commercial products.

In the early part of the 20th century Italian physicist Prima Levi asked; "Would all the philosophers and all the armies of the world be able to construct the little fly?"

As the science and technology of aircraft flight developed, all the theory showed that insects, like flies and bees should not be able to fly. Their wing surface area and body mass are 'wrong.' But, contrary to the theory, these insects fly extremely well.

Today, inventors are working on plans to develop artificial flies and bees. Their objective is to manufacture a small 'spy-plane' that can be remotely steered into buildings, down passageways, or even through smaller spaces like air-conditioning ducts, can hover and turn through extreme angles.

In fact, several experiments have been carried out in laboratories where tiny electronic devices have been implanted into flies and moths and then used to control their flight and record what they see.

So across the world the hunt is on to build a veritable army of nano-machines which can swim up a person's bloodstream and into the heart to carry out remote surveys, or be used to remotely guide flying bullets. The list is almost endless.

As with the construction of any machine, components are essential and now tiny nano-structures are built using nano-materials which then work together to perform a particular function such as repelling water on the surface of a window pane.

In South Africa at the CSIR in Pretoria, there is the National Centre for Nano-Structured Materials. Its focus is on the design and modelling of novel nano-structured materials and researchers there are working in such fields as solar cells, printed electronic devices, bio-sensors and nano-polymers.

There is also a nano-technology centre at Mintek in Randburg that concentrates on nano-technology related to water purification, health, mining and minerals. The Mintek consortium includes the DST, the Medical Research Council, the Water Research Commission and the Universities of Johannesburg, the Western Cape, and Rhodes.

Projects include the investigation of gold-based chemo-therapeutics to treat diseases such as cancer and malaria, to using gold nano-particles as catalysts to detoxify air in mines.

Other possibilities include technologies to monitor temperature, termites and fungus in large tree plantations that are commercially important for paper production.

Nano-technology opens up vistas for the conceptualisation of all sorts of exotic ideas and one example of this is 'printing' electronic components using a printer that prints the electrically conducting material and any insulator material required, in much the same way as ink is printed on paper.

After all, the integrated circuit is not only a two-dimensional 'road map' but is also three dimensional – much like ascending a flight of stairs – so the printing places one 'map' on top of another ensuring that there are vertical electrical connections where necessary.

Projections are that such devices could be available within a decade, and at a fraction of the cost of the devices of today.

For nano-technology devices, the challenge facing the development of new, commercially successful ventures is not only to get the science and engineering right but to do so at a competitive price.

Other projects underway in South Africa include quantum dot technologies. These are very small biological products typically 70nm in diameter, known as bacteriophages. They reproduce and have DNA but do not actually conform to the normal criteria for living things. They are found in places such as the human gut, and are called 'phages' for short.

Phages are produced on a molecular assembly line and in nature have to be assembled in the correct sequence. Some of the protein on the phage appears to recognise computer chips and binds to these chips.

There is a technique known as phage display for the creation of Genetically Engineered Proteins for Inorganics (GEPI). The general idea is to use these sort of semi-living phages to build devices, since they will bind to inorganic substances such as zinc sulphide. The phage itself also becomes part of the fabric of the device under construction.

The essence of any computer is millions of switches that can either switch 'on' or 'off.' An objective is to use the phage-construction technique to build quantum dots, which are nano-sized switches. In principle, one can make such switches about 3nm in size.

Nature has been using nano-technology structures for millions of years and as mankind investigates nature's 'brick-laying with atoms', many more ideas and discoveries will emerge. Clearly, the world of nano-technology seems set to continue evolving and developing as researchers, scientists and academics unlock more of nature's secrets and apply them in the commercial world.

Eskom must reconsider tariff increases

By Mohamed Fayaz Khan – a member of the SAIEE and a senior engineer in the electricity distribution industry

The present state of the electricity industry, in that it is in a shambles, is well documented , understood and often ridiculed. The current price of electricity is not sustainably viable and significant capital is required to expand our baseload generating capacity to ensure that we do not again experience energy interruptions like we have experienced in the recent past.

The present situation was primarily a result of mistakes/ indecisiveness on both the part of the National Government and Eskom. My point, going further, is simple. We need to move on from here! Now is the time to address the dire situation we find ourselves in and formulate a recovery process as a nation.

I have chosen to write on this topic now as Eskom has recently submitted its proposed revenue application for the three year period 2010/11 to 2012/13, entitled MYPD2 (Multi-Year Price Determination). The '2' at the end of MYPD2 signifies that this is the second such revenue application. Essentially Eskom requires considerable funding in the next few years and hase provided the public with two possible options on how it should increase the price of electricity from appropriately 33c/kWh to 88c/kWh in the next three years.

Option One is so absurd that I am mentioning it purely for information. It involves a 146 percent increase in the first year of the MYPD2 period (from 33 c/kWh to 75 c/kWh) and two increases of 12 percent thereafter. Even Eskom mention the severe impact that such an increase in one year would have on the country and the utility therefore recommends Option Two. Other than to shock, I cannot see another reason why Eskom would have even bothered mentioning this option in their proposal.

Option Two, the one recommended by Eskom, is based on the smoothing of the price increase over the three year period ie a 35 percent electricity price increase for the next three years! This option actually results in shortfalls of cash to Eskom, to the tune of R32,7-billion in year two of the MYPD2 period.

Eskom assures us that various options would be explored to address the funding shortfall eg additional guarantees by Government. Personally, the fact that that was the only example cited on how the expected shortfall was to be funded in the executive summary of the MYPD2 proposal did not inspire confidence in the rest of the plan.

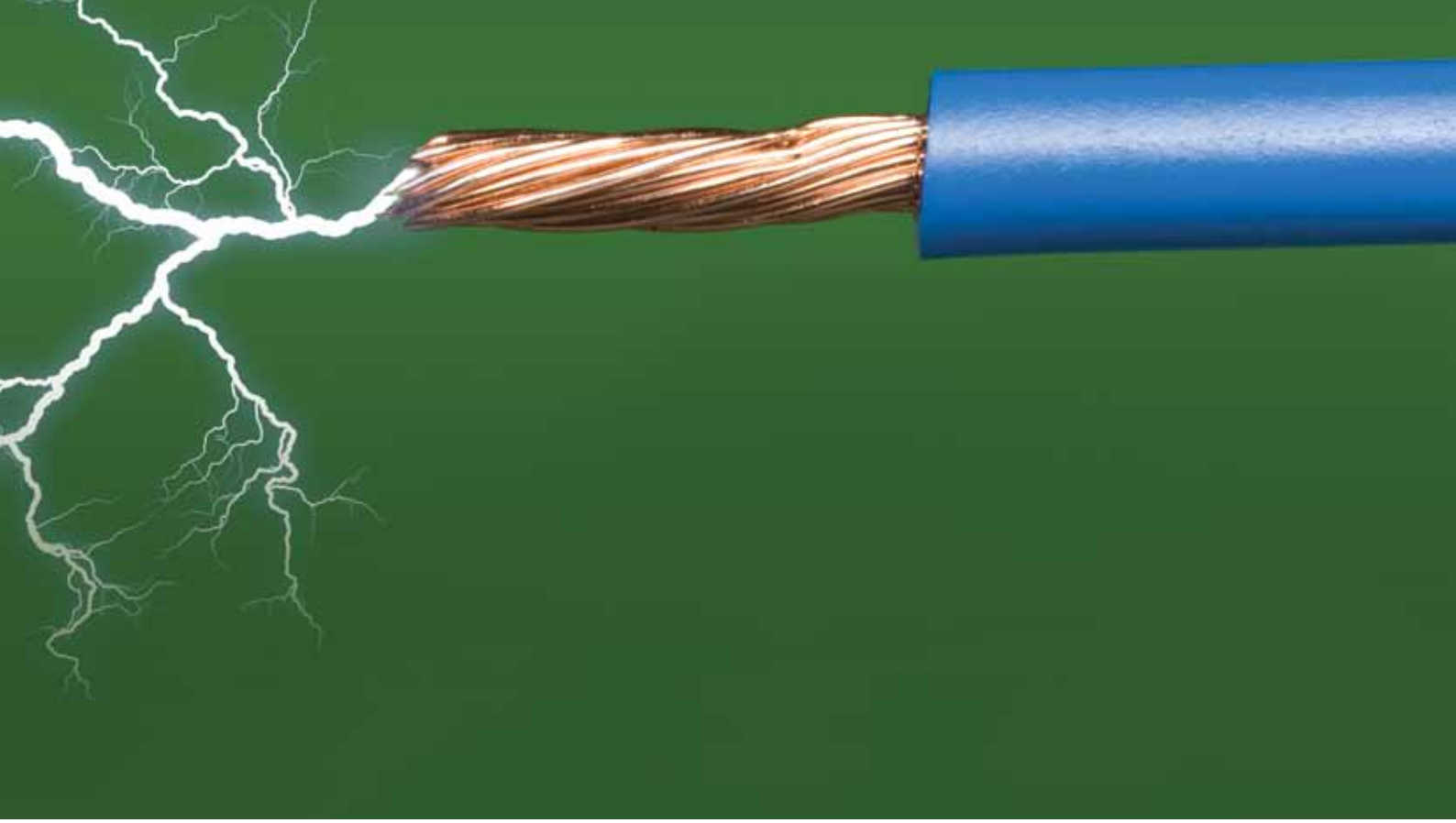
The pricing proposal primarily provides the assumptions and projections used to determine the appropriate price level that has to be established but does explore the effect that this would have on the economy and the country.

This effect needs to be expressed and communicated by the citizens of this country. The National Electricity Regulator of South Africa (Nersa) has scheduled public meetings to discuss the proposed tariff increases and I urge everyone who can attend to attend.

If you are unable to attend, write to Nersa and express your concerns, ideas or opinions. I am not advocating a childish flurry of e-mails, letters or phone calls demanding that the Eskom board be sacked or that the increase must not be higher than inflation or anything similar.

Nersa has a legislated duty to ensure the security of supply and a sustainable electricity industry and will not take such requests seriously. Briefly reading the proposal, I found people may want clarity on the following issues:

- What protection would there be for pensioners from this proposed tariff increase?
- How would charities, orphanages or other welfare organisations already crippled by the recession continue to operate with the proposed tariff increases?
- What is the future of the Universal Access Plan (Electrification for all South Africans)? Although electrification connections are funded by the Department of Energy, electricity consumers would be funding the increased capacity required to supply power to these additional homes.
- The effect of the termination of the Coega Aluminium Smelter Project on the



assumptions made in this proposal. An agreement was negotiated to provide for the long term purchase of up to 1 355 MVA of electricity. Since this deal was officially terminated in October, what effect does this have on the capacity requirement forecast?

- Based on the above, is the strengthening of the transmission infrastructure to the Eastern Cape, still economically viable?
- Should Nersa first sanction an independent audit of Eskom to ensure that there are no inefficiencies that could be contributing to the operational costs at Eskom?
- The report on coal procurement at the heart of the Jacob Maroga saga (written by energy consultant Susan Olsen) states that Eskom's coal procurement problems could be fixed in less than 18 months. The leaking of the report to the media became a matter of racism, but regardless, should the recommendations on how to rectify the problems that exist not be re-visited?
- As part of the capacity expansion plan costs, mention is made of the return to service of Camden power station which according to the 2009 annual report is already complete.
- Why is the environmental levy of 2c/kWh considered if it was already incorporated in the last tariff increase? Furthermore, what does government intend to do with the projected tax revenues that it would obtain as a result of the imposition of this levy over the next three years? I believe that the money should be ring-fenced and used to either support renewable energy projects or effective Demand Side Management initiatives.

I believe all of the above to be valid points that Nersa, Eskom and the government should consider when making this decision and am certain that there are many more viewpoints or suggestions that need to be considered.

I urge you again to constructively become a part of the solution to this crisis.

I would like to now unpack some of the shortcomings that I find in the present proposal, and I need to start with the continuation of the mantra regarding how Eskom is committed to fighting climate change. According to the proposal, one of the six principles adopted by Eskom in defining it's role is: *Creating a sustainable economy, not harmful to the environment and committed to climate change mitigation strategies.*

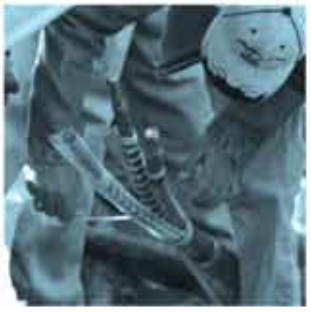
The National Business Initiative last month revealed the results of its third annual *Carbon Disclosure Project* and Eskom topped the list with reported emissions of 220-million tons of carbon dioxide, Sasol came in second with 61-million tonnes. Considering that the total emissions estimated for South Africa is 440-million tons, I think it is safe to therefore assume that Eskom is, in fact, "harmful to the environment".

Before I am labelled a "greenie" or "tree-hugger" who does not understand the constraints on the South African electricity industry and how cheap electricity has enabled our economy to flourish, let me state that I understand why it is impossible to consider using renewable or nuclear energy to increase our baseload generating capacity. The associated costs would be even more unrealistic than the current proposal.

Like the politician who pledges to combat climate change by reducing his carbon footprint before departing in his three-car, high speed motorcade, let us start being honest about what we are doing. You are not committed to climate change if you intend building two new coal-fired power stations with a combined output of 8700 MW to include in our generation pool.

Neither should pumped storage be considered progress in renewable energy because conventional power will still be utilised to return the water to the upper reservoir during times of low demand.

A possible solution that would have mitigated the effects of climate change and kept costs at similar, if not lower levels, would



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have been increased spending and greater focus on Demand Side Management (DSM). To prove my point, I would like to quote from the current MYPD2 proposal.

"The capital cost of the DSM programme over the three years equates to an average cost of R5,8-million/MW (R6 213-billion for 1073MW in savings) which is significantly lower than any supply side option." (Page 45 MYPD2 Application)

The existing proposal calls for an increase in DSM spending from R800-million currently to R2,8-billion in the financial year 2012/2013. Is this sufficient? Are CFL globes, low flow shower-heads and a R2 000 subsidy on a R15 000 solar geyser the only options for effectively reducing our energy consumption?

Historically, South Africans have never been very efficient users of electricity. There must be many options to introduce further energy savings on the grid. Effective reduction in demand may negate the need for an expansive supply side option.

I am also concerned about the two new planned coal fired power stations. Examining the possible costs associated with accepted cabinet positions on climate change as listed in Annexure 2 of the MYPD2 proposal, I wonder whether, factoring those future costs into account, the addition of so much more coal generated power is economically viable.

I refer primarily to the proposed carbon dioxide tax of R250 per ton, which is rumoured to start at R100 a ton and then ramp up. On our existing emissions, that would mean an additional R22-billion a year increasing to a potential R56-billion a year. Add to this the proposed carbon dioxide emissions cap, carbon capture readiness and the scarcity of water caused by climate change and even renewable options and active DSM suddenly starts making a lot more sense financially.

The existing MYPD proposal represents a simple and unimaginative solution. It is simply a case of determining the cheapest way of alleviating the crisis and getting the electricity consumer to fund this cost. The ideas presented for consideration in this article are by no means representative of a complete solution that would alleviate the current crisis and come with their own associated risks. They, among others, should however be considered in an effort to keep the increase required to a minimum.

Another aspect that the proposed MYPD is not taking into account is the increased theft of electricity that would invariably be caused by the proposed price increases. More staff/ funding would in fact be required to control this and I do not believe that this has been adequately factored into in the current proposal. The MYPD proposal is a very large document and I would welcome the confirmation that the factors mentioned above are indeed taken into account, but the proposal is difficult enough for engineers in the industry to make sense of, let alone the average citizen.

In such an application, assumptions need to be made regarding the proposed growth in sales, the GDP trend, foreign exchange rates and the demand for electricity going forward. Perhaps, these are some of the assumptions that should be realistically reconsidered when assessing the validity of this proposal.

One of the assumptions that I could not understand, admittedly because of my lack of finance experience, is how the proposal could assume that CPI and PPI would remain low (5,7 percent and 6,7 percent respectively), when the price of electricity would be increasing so considerably. Surely, manufacturers and retailers would start charging considerably more for their products in light of the increased production and operational costs.

In my opinion, the present MYPD proposal put forth by Eskom to Nersa represents a solution to the crisis, but I believe that this proposal is one that is being made primarily with Eskom interests in mind. I do not doubt that Eskom is taking into account the effect that this decision would have on the South African economy, if not the economies of Africa.

Eskom is functioning as a company that has to ensure its viability and value to its shareholder, the South African government, and even while doing so, is projecting a R30-billion shortfall at the end of the third year of the proposed MYPD.

This is a national crisis and is one that should be tackled by everyone in the country. Nersa has a requirement to ensure the sustainability of the electricity supply to the country and would not be able merely to grant an electricity price increase that would be viewed as favourable by the South African public.

I hope that national government, industry, Nersa and Eskom revisit this proposed MYPD after all the stakeholder input has been consolidated.

Naxx25 on Saturday Night

It is Saturday night and 25 of us have gathered to defeat Thaddius. This will require coordination. Firstly we will have to split into two groups and destroy his two lieutenants, located some distance apart, within five seconds of each other. If we succeed we will have only a couple of seconds to leap onto the platform where Thaddius himself waits.

Thaddius throws out charge and people who get the same polarity have to stick together and avoid those of opposite polarity. If one negatively charged avatar hangs around in a group of positives for too long everyone in that group will die and it will wipe out the raid. It gets trickier in that the polarity of random people in the raid shifts every few seconds, so we have a pre-set rotation policy of where to go and what route to take when that happens.

Some people struggle with this though; all it takes is one or two of the 25 to get it wrong and we fail. My own problem is simpler. I repeatedly cannot make the leap onto Thaddius's platform in the first place. I am a melee orc, my plate armour is heavy, and I am in South Africa on a basic laptop while the server is somewhere in Europe. That together with my low cost ADSL connection means latency of over half a second on a very good day and a much lower frame rate per second than I would like. It means my orc does not see things as quickly as he should, does not react rapidly, and my control over him is not nearly as good as the more adept players manage with their avatars. Unless I fluke it I cannot get the timing of the jump right.

In fact the previous Saturday night I spent over an hour swimming in acid, while the raid tried and repeatedly failed to kill Thaddius. This is personally very frustrating and also unhelpful to the group, as I and my axes are out of the battle, and one of our healers has to focus away from the battle and expend energy on keeping me alive.

I have to try and make up for my latency, bandwidth and processing power deficiencies by being clever, and my orc has, as one of his professions, engineering. In preparation for this night's battle my orc learned an obscure engineering recipe that enabled him to tinker a booster onto his boots. When activated, this allows him to run faster and further for a short while. It is an experiment, which I hope will see me through the dreaded leap onto Thaddius's platform, because if I spend much more time swimming in the acid pool below the platforms I won't be invited back.

Let me take a step back. Where am I, how did I get there, and for that matter why am I there? Where I am is one of the relatively advanced stages of the vastly popular massively multiplayer online role-playing game (mmorpg) World of Warcraft (WoW). Getting to Naxx25 is not trivial, though neither is it the absolute pinnacle of the game these days.

It started with a WattNow assignment I gave myself back when I was editing the magazine in 2007, which was to see how far gaming had evolved since my university days. The evolution, it turns out, has been dramatic. As far as the limits of a fairly basic PC would allow, I tried a couple of the highest rated and most popular computer games around, admired the capacity of the game engines, the graphics which at their best are high art, and even the storylines – some with genuine plots and flow.

Having realised how very archaic these games make television seem, that declining one-time default for mass entertainment, I had to take one more step. To really understand where gaming has evolved, to I needed to try to see if it was possible with my limited infrastructure to play one of the massively multiplayer online offerings. The gamble was an investment in the game software which, even with buying it on disc, resulted in some 3+ Gbytes of internet downloads that on my set-up took days rather than hours – and an initial monthly subscription to what is arguably the most successful gaming phenomenon to date. The PC Gaming Alliance estimates that WoW subscriptions and sales bring in hundreds of millions of dollars a year, perhaps even as much as US$1 billion.

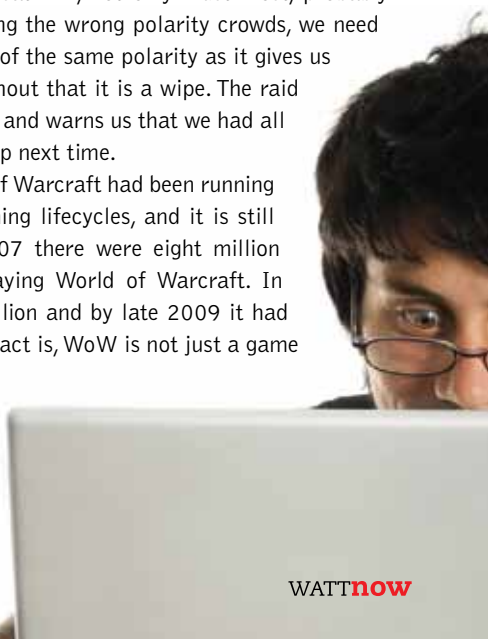
On our next attempt we mow down the Thaddius's two lieutenants easily and it is time for the dreaded jump to his platform. I activate my boots – they work! I make the jump with plenty to spare. In fact I am so excited about this I forget to stop in time and speed off the platform into the acid.

It does not matter. I am not the only one in the acid and those on the platform have made a complete mess of their polarity coordination. Too many of us are dead and those who are left won't be able to close out the battle.

Thaddius has an enrage timer of five minutes, which means if we don't down him before that time is up he will go berserk, get infinitely stronger and kill us all. To beat him, not only must most, probably all, of us stay alive by avoiding the wrong polarity crowds, we need to stick together with people of the same polarity as it gives us a power- enhancing buff. Without that it is a wipe. The raid leader is becoming frustrated and warns us that we had all better make the platform jump next time.

In November 2009 World of Warcraft had been running for five years, an eon in gaming lifecycles, and it is still growing. At the start of 2007 there were eight million people around the world playing World of Warcraft. In 2008 that number hit 10 million and by late 2009 it had passed the 12 million mark. Fact is, WoW is not just a game it is a platform in its own right.

The logistics behind the game are formidable. World of Warcraft uses



20,000 computer systems, 1.3 petabytes (1,300,000 gigabytes) of storage, and its owner Blizzard Entertainment employs more than 4,600 people organised into 30 departments. It controls data centres from Texas to Seoul, and monitors over 13,250 server blades, 75,000 cpu cores, and 112.5 terabytes of blade RAM.

Among the company's divisions is a 32 person programming team responsible for some 5.5 million lines of code. There is a 50 strong art department responsible for 1.5 million art assets since one of the secrets of WoW's success is in its attention to detail; there is an entire team dedicated to creating wheels of cheese, torches, and other details that make the game world feel alive.

There is a 37 member design department which over the years has created some 70,000 spells and some 40,000 non player characters. There is a 123 strong cinematics group, an in-house sound department including its own composer and there are 27 hours of music in World of Warcraft.

A localisation group translates and culturalises World of Warcraft into 10 different languages, and it turns out there are more people playing WoW outside of the English language servers.

The scale of the patches is illustrative. One of the several major patches and content upgrades that went out in 2009 pushed some 4.7 petabytes of data to the players, equivalent to 62.5 years of high definition television video. That is equivalent to over four months of traffic carried by Internet Solutions in South Africa on its network at present rates, and equivalent to two years worth of traffic carried on the MTN system at current rates.

On the next attempt we do much better. Hardly anyone ends up in the acid, the polarity switches are better synchronised and people can concentrate on doing damage to Thaddius. It seems we are going to make it, but a few of us fall in battle before the end and with less than two percent of his life left Thaddius enrages. It is a wipe.

We try again and again, incredibly we fail but get closer, with Thaddius having less than a percent of his health left.

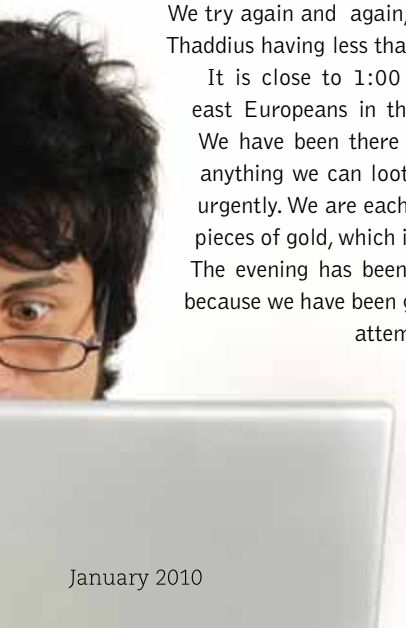
It is close to 1:00 AM in my time zone (later for the east Europeans in the group, a bit earlier for the Brits). We have been there for many hours and have yet to kill anything we can loot. Most of us need to repair our gear urgently. We are each looking at repair bills of 50 or more pieces of gold, which is not entirely trivial, even at this level. The evening has been expensive, and without reward. But because we have been getting ever closer we vote on one last attempt; this time we will defeat Thaddius.

No one wants to leave now.

Each piece of gold spent has to be earned somehow, and no matter how well one trades using the game's auction houses, one has to ultimately earn gold by grinding through less interesting aspects of the game. Like in the real world, earning gold takes time and time has a value, and one never has enough gold because there are always better pieces of equipment, scrolls, jewels, potions, recipes, materials for our crafts and faster steeds that will enable one to go further in the game. Hence there is a large competitive black market trade in gold associated with WoW, gold that some people somewhere farm all day and sell to others for real money. Translated from euros and dollars the going rate typically varies from about R50 to R150 for 1,000 pieces of gold. I, like most, earn my own gold. Apart from an aversion against violating the ethos of the game, I don't want to venture into the underground world of gold sellers, some of which are fronts for identity theft operations.

A long term survey on the psychology of mmorpgs, with a substantial sample base of 35,000 people, notes that people who enjoy gradual advancement in a fantasy world where they take on roles as ogres and elves are not a random slice of the population.

True, but if you think computer gaming is just for adolescents you are as out of touch as those who still think television is the untouchable monolith of mass entertainment it once was. Other surveys suggest the age of the average mmorpg gamer is 35 years, but I would rather trust the one on the psychology of gaming with its larger sample base. It found the average age to be about 26, and that only 25% of mmorpg players are teenagers. About 50% of mmorpg players have full-time jobs, about 36% are married and 22% have children.



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In all cases, team submissions are allowed, but prize money will be divided evenly among team members (or in a ratio agreed to by all team members).

CLOSING DATE FOR ENTRIES (which should not be longer than five typed pages, double-spacing) is 26 February 2010. Email the Editor, Glynnis Koch, at chemtech@crown.co.za, for more information and an entry form, or telephone 011 622 4770 and ask for Glynnis.

Winning articles will be published in the April 2010 issue of 'Chemical Technology'.

To earn our places in Naxx25, it has been months of evolving our avatars, first through the 80 levels of the game, and then through the more invisible but very real levels beyond level 80, building up equipment, experience, expertise, and in-game social networks. Everyone there has invested a significant part of themselves in the game; we are in fact a highly self selected group of people.

It is a very social and structured environment, with hierarchical guilds. It is the only environment I can think of where a teenager can lead a group that is on average much older than he. And it is not only an exploration and learning ground for teenagers. It takes skill, leadership and management ability to successfully run a guild comprising 100 disparate people from around the world.

This time we all make the jump onto Thaddius's platform, people are getting the polarity shifts right, no one is dying. It comes down to a pure damage per second race between us and Thaddius's enrage timer. It is going to be close, but it is going well. With only seconds left the raid leader urges us to use our most potent last resort emergency abilities! Thaddius is down to a tenth of a percent of his health. He is enraging. The spell casters and healers are falling like flies, and with the healers gone the melee players are being mowed down. But my orc has more armour than most, and is using his powerful end game execute blows; just two more strikes and he can finish it alone. One more swing of his axes and he could be the unlikely hero, but my orc is dead and the raid is down. Thaddius has less than one five hundredth of a percent of his health left, but we are all down. It is after two AM on the realm's clock, which happens to coincide with SA time, and most of us are exhausted. The field belongs to Thaddius.

It is predicted that within five years, the majority of internet users will have some sort of genuine meaningful social community on the net, the key word being meaningful.

With WoW, all you ever get is a glimpse of a life somewhere:

The forty-something undead healer from Norway who finds that WoW is where he and his 14 year old son get to know each other better;

The Welsh head of my guild, whose demanding job means he sets a bad example in meeting online commitments, but who gifted my orc a shield worth about 1,000 gold so I could progress faster;

The ebullient death knight from an island near Holland, who lingers in our less than stellar guild out of loyalty despite the lure of more organised outfits that would better suit his talents and ambition;

The specialist in game obscurata, a warlock from the UK, unemployed during the recession, who has probably spent more hours than he would like to count obtaining over 80 more in-game pets;

The hunter troll from the Balkans who says little but is always there, on time, fully prepared.

One of our earnest raid leaders, a Scandinavian I strongly suspect is a teenager (largely because of the tenor of his voice when he speaks on the skype type system we sometimes use during raids), who spends half an hour explaining tactics to a group with disparate abilities, including fluency with English, and then is willing to explain it all over again;

The tauren druid from somewhere near London who likes to get drunk before he plays, I guess to simulate the pub-like atmosphere he finds appealing;

The kind blood elf who works at mastering the game's most difficult skill of tanking, deflecting the battle to her well armoured avatar away from more lightly armoured ones, before she has to go off and do her daily housework.

Though I don't know and never will know their real names, ages and in many cases genders, these are people I have gotten to know well.

Crushing Eskom increases will hurt consumers

Widespread condemnation of Eskom's application for rolling price increases of 35 per cent per year for the next three years has been received by the National Electricity Regulator of South Africa (Nersa) during the public hearings held at various centres throughout the country.

Among the most vociferous of these critics is the South African Institute of Electrical Engineers whose President, Johan Grobler warned that the higher electricity costs will be inflationary, create significant financial hardship, especially for the poor and may even cause some industries to close down altogether.

In a written submission to Nersa, Grobler, representing the SAIEE, says that such economic hardships could lead to widespread civil unrest and may even prompt an increase in crime throughout the country.

According to the SAIEE, rushed capital expansion projects undertaken by Eskom may result in less than optimal energy generation, transmission and distribution choices and, further, foreign direct investment in industrial development in South Africa will be at risk if the electricity supply is not available or if the quality of supply is unreliable even though the price of electricity is high.

The Institute says that some of the unintended consequences of the price hikes are:

- Multiple mark-up of the Eskom prices by municipalities who pass on their higher overheads and prices to the consumer;
- The increased price does not mean that better quality of electricity will be supplied, leading to even greater consumer dissatisfaction;
- Higher number of payment defaulters and a rising level of bad debt.

The Institute points out that there has been a steady decline in the quality of electrical infrastructure maintenance, particularly in the distribution network. Moreover, it warns that the increased capital expansion projects may undermine the expenditure and effort needed to maintain the existing infrastructure.

In its submission, the SAIEE expressed a number of other concerns. These include:

- The rationale by Eskom for transporting coal by road for more than 120 kilometres to the Camden power station when coal can be bought from Usutu colliery three kilometres away;
- Eskom's own cost structures and operational efficiencies, particularly those regarding contracts for maintenance work.
- Continued high levels of what Eskom calls non-technical losses, particularly those arising from deliberate non-payment, or the theft of electricity through illegal connections;
- Inefficiency in debt collection procedures, particularly with regard to Eskom's dealings with the state, the many state-owned enterprises and the municipalities.
- The inordinately high increase in staff costs among Eskom's employees;
- The default and non-payment for electricity supplied to some neighbouring countries, more particularly Zimbabwe, which owes Eskom millions of rands.

In order to address some of the many issues facing Eskom, the SAIEE has formulated a plan that, among other things, suggests:

- The introduction of daylight saving and the splitting of South Africa into two time zones (west and east) to spread peak energy demand across a broader timeframe, thus easing the pressure on Eskom's reserve margins.
- A more concerted effort into research and development of renewable energy sources such as concentrated solar power and greater use of solar water heaters.
- Many of the appliances (including cellular phones and computers) use low voltage direct current and Eskom should be providing such current instead of adding to electricity wastage by using alternating current converted to direct current.
- Greater incentives from government, and Eskom aimed at stimulating construction of energy efficient buildings and shopping centres.

Eskom's bitter pill

Eskom's acting chief executive, Mpho Makwana claims that it is better for South Africans to swallow what he calls the 'bitter pill' of electricity tariff hikes now than to prevent price increases that may threaten Eskom's ability to complete its building programme and ensure continuity of stable electricity supplies.

Eskom has refused to answer any of the questions put to it during the Nersa public hearings saying that it will only submit answers to Nersa in writing once the questions have been posed.

Business, mines, unions object to price hikes

South Africa's economy will lose R150-billion and shed about 50 percent of the existing jobs if the Eskom price increase is implemented claims the South African Chamber of Business and Industry.

Harmony Gold's chief executive, Graham Biggs says the increase is excessive and could force harmony to be less competitive internationally, threatening its operations and leading to further job cuts.

Solidarity's general secretary, Dirk Hermann claimed that Eskom is a monopoly and its tariffs are protected. Moreover, it has only one shareholder, the government. This means, he says, that the company could incur more debt and repay that debt over a much longer period.

Effectively, he says, if an alternative funding model is adopted the proposed tariff hike could be cut to just 15 percent. According to Solidarity's figures, Eskom will be under pressure for the next three years, but in years four and five, profits will rise to R85-billion.

Hermann urged the state to take the responsibility for obtaining extra loans for Eskom and increasing its share capital, a suggestion that was largely discounted by Frost & Sullivan's energy analyst Cornelis van der Waal.

He says that such an approach would make sense if the "government had infinite resources" but Eskom's funding needs were so vast that he believed it would be unlikely that the government would provide more than the R60-billion already advanced to Eskom along with the R176-billion provided in guarantees for existing and new debt.

He added that limited funding from banks can be expected in the medium term and the local bond market also has limitations because government needs to raise money for other infrastructure projects.

- Cancellation of contracts that charge less than the cost of electricity to major industrial consumers such as applies to BHP Billiton's aluminium smelters in Richards Bay and Maputo. SAIEE argues that ordinary consumers are being 'taxed' to cross-subsidise electricity supplied to these industrial consumers.
- Using a special national lottery – such as the lottery used to pay for construction of the Sydney Opera House in Australia – to generate additional income for Eskom.

In summarising its recommendations, the SAIEE says:

- Eskom and Nersa must curtail the loss of electricity due to theft and corruption.
- A higher level of accountability for funding and expenditure in terms of both capital and operating expense must be enforced and there must be regular report-backs at a public forum on the progress made by Eskom. Moreover, no bonuses should be paid to Eskom's executives or management unless key performance indicators have been met and an external auditor has sanctioned these.
- Service levels from utilities must be improved and Nersa needs to monitor the quality of supply of electricity from Eskom and the municipal supply commissions. These organisations must be held accountable for the quality of supply.

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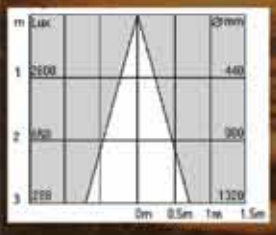

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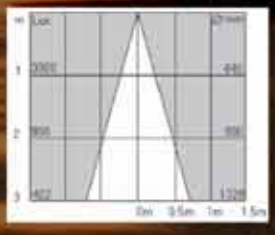

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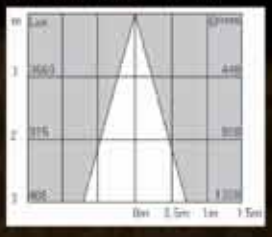

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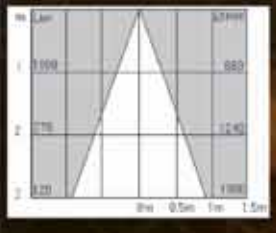

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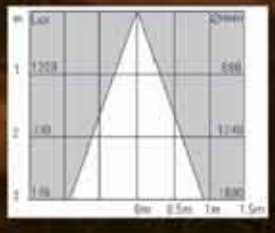

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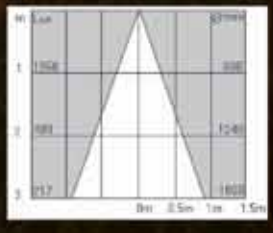

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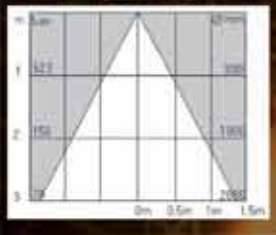

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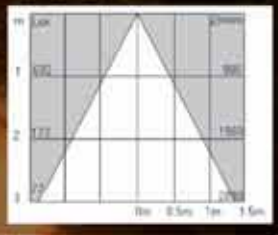

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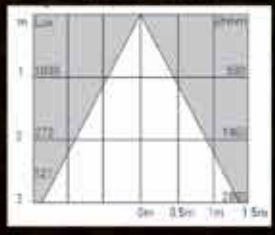

For soft white 4 000 K, add 10% light levels.

- Nersa must monitor the consumer price of electricity, whether bulk, industrial or residential, and ensure that unreasonable retail profits are not added to Eskom's wholesale prices.
- There must be a strong alignment between the government initiatives from organisations such as the Department of Energy and the Department of Public Enterprises and Eskom's capital expansion plans. This is imperative to ensure efficiency, sustainability of delivery and meeting industrial and consumer expectations.
- Further research and development is needed in terms of smart grid technologies, demand-side management programmes, nuclear and renewable energy resources. Each of these should be given appropriate levels of investment by government.
- A proper independent producer pricing regime, with long-term, realistic tariff structures must be put in place. Such pricing agreements cannot be fairly handled by Eskom without a conflict of interests.
- Electricity should be exempt from Value Added Tax as it is already a form of tax given the free and below cost electricity that is supplied to industrial users and neighbouring countries.

The SAIEE questions the business sense of radical price increase as a funding mechanism for capital expansion, when clearly this will drive consumer behaviour to use less electricity and, when this is combined with demand-side management initiatives, it is clear that revenues for Eskom will reduce.

Farmers, Cosatu object to price hikes

Free State farmers and rural communities could face a crisis if Eskom's tariff hikes go ahead according to the president of Free State Agriculture, Louw Steytler.

"Free State is the bread basket for the nation in terms of maize and wheat production and farmers, particularly small scale farmers, could be put out of business if the tariff increases are imposed," he told Nersa delegates during the public hearings on higher tariffs.

His fears were echoed by Free State's Cosatu Secretary, Sam Mashinini who said that such increases would affect job creation and destroy small- and medium- sized businesses throughout the province.

He also warned that these increases could have a dramatic impact on mining companies in the Welkom area where job losses were already high and may rise even higher because of the high cost of electricity.

In North West province, Cosatu's provincial secretary, Solly Phetoe warned that the price rises would really hurt the thousands of poor people in this province and would have a devastating effect on the provincial economy and its effort to create jobs.

Nationally, Cosatu has proposed a 20 percent increase in the price of electricity for the next three years.

It also asks for greater clarity on what will happen to Eskom's profits from the inflated prices once the capital expansion programmes are completed and the loans have been fully repaid.

It concedes that the impact of the price increase will be great but the impact of not addressing the electricity capacity needs of the country will be even worse for the economy and the people of South Africa.

France lends Eskom E1,19-billion

France's export credit agency and five French banks have signed a 12-year E1,19-billion loan agreement with Eskom. The money will apparently be used to buy turbines from the French company Alstom for the Medupi and Kusile power stations.

Analysts say that while the loan is relatively small in terms of the R376-billion needed by Eskom to build the new power stations, it may help to unlock additional loans from organisations such as the World Bank and the African Development Bank.

It emphasises the point, though, that the fair payment for electricity must apply to all consumers in South Africa and it must be proportionate to their usage.

In its submission the SAIEE points out that there have been some positive developments emanating from the rolling blackout imposed by Eskom in 2008. These include:

- Greater awareness of electricity consumption among all consumers. This has led to a change in behaviour including the installation of geyser blankets and hot water pipe insulation, greater use of solar water heaters and an increased reliance on liquefied petroleum gas for cooking;
- Architects and engineers have focused on designing and building more energy efficient buildings to reduce energy usage, particularly in the light of likely, but punitive, price increases.
- Industries other than Eskom are generating their own electricity and this can be used to augment the existing power to the grid supply once the commercial structures for payment have been mutually agreed.
- Greater use of smart-grid technology will enable South Africa's electricity distribution network to eliminate inefficiencies in the supply chain and reduce technical losses.

Nersa is only due to rule on Eskom's tariff increase in March this year once all the submissions have been considered. While there is some doubt about the extent of the tariff increase, there is no doubt that South Africans – at all levels – will be paying much more for electricity soon.

How much more depends on Nersa.

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Are carbon emissions from power stations really that bad?

This article, written by Terence Caldwell, an engineer who spent 25 years working for the Electricity Commission of New South Wales in Australia where he was responsible for commissioning and operating the various power units, was sent to me by Andre Kemm of Transnet. It's a fascinating insight into the carbon emissions from power stations. The article was originally published in the Rockhampton Morning Bulletin in December 2009.

I have sat by for a number of years frustrated at the rubbish being put forth about carbon dioxide emissions, thermal coal-fired power stations and renewable energy and the ridiculous Emissions Trading Scheme:

- Frustration at the lies told (particularly during the election) about global pollution, using Power Station cooling towers for example. The condensation coming from those cooling towers is as pure as that that comes out of any kettle;
- Frustration about the so-called incorrectly-named man-made 'carbon emissions', which of course are carbon dioxide emissions, and what these are supposedly doing to our planet;
- Frustration about the lies told about renewable energy and the deliberate distortion of renewable energy and its ability to replace fossil fuel energy generation.
- And further frustration at some members of the public who have not got a clue about thermal power stations or renewable energy – people quoting ridiculous figures about something they clearly have little or no knowledge of.

First, coal-fired power stations do NOT send 60 to 70 percent of the energy up the chimney. The boilers of modern power stations are 96 percent efficient, and the exhaust heat is captured by the economisers and reheaters, and heats the air and water before entering the boilers.

The very slight amount exiting the stack is moist as in condensation and carbon dioxide. There is virtually no fly-ash because this is removed by the precipitators or bagging plant that are 99.98 percent efficient. The four percent lost is heat through boiler wall convection.

Coal-fired power stations are highly efficient with very little heat loss and can generate massive amounts of energy for our needs.

The percentage cost of mining and freight is low. The total cost of fuel is eight percent of total generation cost and does NOT constitute a major production cost.

As for being laughed out of the country, China is building multitudes of coal-fired power stations because they are the most efficient for bulk power generation.

We have, like the USA, coal-fired power stations because we HAVE the raw materials and are VERY fortunate to have them. Believe me, no one is laughing at Australia - exactly the reverse, they are envious of our raw materials and independence.

Yes, it would be very nice to have clean, quiet, cheap energy in bulk supply. Everyone agrees that it would be ideal. You don't have to be a genius to work that out. But there is only one problem - It doesn't exist.

Yes, there are wind and solar generators being built all over the world but they only add a small amount to the overall power demand.

The maximum size wind generator is 3 MW, which can rarely be attained on a continuous basis because it requires substantial forces of wind. And for the same reason they only generate when there is sufficient wind to drive them.

This of course depends where they are located but usually they only run for at between 45 percent and 65 percent of the time, mostly well below maximum capacity. They cannot be relied upon for a 'base load' because they are too variable. And they certainly could not be used for load control.

The peak load demand for electricity in Australia is approximately 50 000 MW and only a small part of this comes from the Snowy Hydro Electric System because it is only available when water is there from snow melt or rain.

Here are some facts that will show how ridiculous is this financial madness the government is following. Do the simple maths and see for yourselves.

According to the 'believers' the carbon dioxide in the air has risen from .034 percent to .038 percent over the past 50 years.

To put the percentage of carbon dioxide in air in a clearer perspective: If you had a room 3,7 m x 3,7 m x 2,1 m, the area carbon dioxide would occupy in that room would be .25m x .25m x .17m or the size of a large packet of cereal.

Australia emits one percent of the world's total carbon dioxide, and the government wants to reduce this by 20 percent or reduce emissions by 0,2 percent of the world's total carbon dioxide emissions.

What effect will this have on existing carbon dioxide levels?

By their own figures they state that the carbon dioxide in air has risen from 0,034 percent to 0,038 percent in 50 years. Assuming this is correct, the world carbon dioxide (in the air) has increased in 50 years by 0,004 percent.

Per year that is 0.004 divided by 50 = 0.00008 percent. (Getting confusing - but stay with me).

Of that, because we only contribute one percent of the total emissions, Australia's emissions would cause carbon dioxide levels to rise 0,00008 divided by 100 = 0.0000008 percent.

Of that one percent, we supposedly emit, the government wants to reduce it by 20 percent, which is one fifth of 0,0000008 = 0.00000016 percent effect per year they would have on the world carbon dioxide emissions based on their own figures.

That would equate to an area, in the same room, that's about the size of a small pin.

For that Australian legislators and 'greenies' have gone crazy with the ridiculous trading schemes, solar and roofing installations, clean coal technology, renewable energy and so on and so forth. How ridiculous is that?

All for the sake of saving carbon dioxide that's equivalent to the size of a small pin.

[Some enterprising South African engineer might like to do a similar case study using figures from Eskom and Sasol. It might be quite illuminating. – Paddy]

Engineering skills are the key to South Africa's future, claims Manuel

After more than 20 years of under-investment in the economy, South Africa's investment has grown to almost 25 percent of gross domestic product in the past three years and this high level of investment must be maintained for at least a generation according to planning minister Trevor Manuel.

He was addressing delegates attending the centenary banquet of the South African Institute of Electrical Engineers held at the Wanderers Club in Johannesburg at the end of November 2009

Manuel warns that South Africa needs much higher levels of fixed investment in power generation, refining capacity, broadband infrastructure and in water, rail, road and public transportation infrastructure. In addition, much more money must be invested in housing, sanitation, schools and upgrading of hospitals and clinics throughout the country.

"These are the kinds of challenges that terrify economists but that make engineers in all disciplines drool with anticipation and excitement," said Manuel. "Infrastructure investment is critical and apart from helping the country meet its social objectives, it creates jobs, enables future growth and facilitates broadening of opportunities for the marginalised," he said.

Manuel confirmed that government's infrastructure spending plans had risen from R787-billion announced last year to R872-billion over the next three years. Half of this will be implemented by state-owned enterprises and about 30 percent of it will go into electricity to build two new power stations, pumped storage schemes, wind and solar power plants and to improve the countrywide distribution networks.

Referring to the economic outlook for South Africa, Manuel warned that national output is expected to shrink by about two percent this year with a slow and gradual recovery in the next few years. Growth of 1,5 percent in gross domestic product is projected for the current year.

"However, we are unlikely to get back to a five percent growth rate within the next three years," he warned. "This bleak outlook means that we must think carefully about how we respond to the world economic crisis and what steps we will have to take to transform our own economy," he added.

Manuel says that while the financial pressure will remain a factor in future investment in infrastructure for the foreseeable future, there are other challenges facing engineers such as reducing the high level of carbon emission emanating from Eskom – which produces 200-million tons of carbon dioxide annually – and Sasol – which produces 70-million tons of carbon dioxide, earning it the dubious distinction of being one of the largest privately-owned polluters in the world.

"Economists and environmentalists see these are problems, while engineers see them as opportunities: opportunities to innovate, to learn, to experiment and to make a difference to the world," he said.

"Alternative energy is something that South Africa must increasingly use and, while projects such as the Congo River hydro-electric scheme have the potential to generate a huge amount of clean, relatively cheap energy, there are other problems associated with this.

"Electrical engineers in the field tell me that at present we do not have the technology to transport power over long distances without massive line leakages. This problem excites electrical engineers and I am aware that millions of rands are being spent on developing more efficient distribution technologies so that we are able to produce more electricity from the Congo and have the technology to transport it to where it is needed," he said.

Referring to green energy, Manuel points out that there is significant potential from new solar and nuclear sources and there is an entirely new source of green energy from algae, providing an endless list of engineering possibilities and challenges.

Manuel says that the latest craze in the energy sector is smart grids where developed countries are investing billions in a technology that turns every house and firm into both a buyer and a seller of electricity.

"Technologies such as these offer Africa the opportunity to leapfrog the developing world so we must, of necessity include Africa as a source for true innovation within the engineering world where leadership and innovation are intrinsic within the profession," he said.

Manuel cautioned engineers not to let a sharp rise in costs start to undermine future infrastructural development and warned that costs have already escalated significantly in South Africa.

"Sharp cost increases may provide some short-term benefits to one or other sector but they actually undermine the sustainability of that sector at the same time. The level of price increases in several large engineering projects is having a really negative effect on the government's ability to sustain strong growth in the years ahead," he warned.

"While it may be understandable that after a long drought in engineering projects, the engineering and construction sectors now feel that they must gain handsomely from any new investment. However, such a mentality is both inconsistent with the values on which our engineering sector was built over the decades but is also inconsistent with a mindset that says this boom will last for a generation or more.

"I therefore appeal to you all, as engineers, to look beyond the short-term fluctuations in the economy and focus rather on longer-term projects needed to modernise and upgrade our existing infrastructure," he said.

Manuel believes that in order to build a

sustainable engineering sector, two things are essential:

- The first is to develop strong and resilient partnerships between engineering sectors and those organisations that buy engineering services. These partnerships should be based on mutually beneficial objectives to grow the industry, to ramp-up infrastructure spending and to improve the lives of millions of marginalised people in South Africa. In view of this, Manuel says, short-sighted, predatory pricing and anti-competitive behaviour is not sensible in the long-term either for the engineering sector or the government.
- The second most crucial element is to grow the skills base at all levels as, without the skills, it's impossible to deliver the future infrastructural requirements for the country as a whole.

"As I look around me I am reminded that most of our engineers are closer to my age than to that of my sons. During the past twenty years of under-investment in engineering, our engineering capability has suffered immensely.

"Too large a proportion of smart, young, numerate people went into the financial services sector rather than engineering and this was not just the case in South Africa either," he added.

Citing statistics published by the Financial Times, Manuel said that India faces a chronic shortage of engineering skills as it has only 110 000 highway engineers compared with China that had five times that number when that country expanded its roads infrastructure in the 1990s.

"What shocked me about this example is that India, from the time that the India Institute of Technology was established by Prime Minister Nehru, produced sufficient engineers to meet its needs and to exports skills to other parts of the world. If India faces a crisis now, how much larger is this crisis in other parts of the world?" he asked.

According to a study by the Royal Academy of Engineering in Britain, that country will have to actively start recruiting engineers from South Africa, India and China to plug the engineering gap that exists in the United Kingdom.

The picture is much the same in the United States where there is a shortage of about 75 000 engineers, making it almost impossible for that country to reach its renewable energy targets let alone any of the other engineering goals it has set for itself.

"I raise the skills issue as a critical challenge because if engineering firms continue to recruit from each other to fill skills gaps and only succeed in meeting employment equity targets by offering higher and higher salaries then we are doomed as we will not be able to meet the enormous challenges that face us in the years ahead," he said.

"This demands that young people who are currently still at school must be persuaded to seek a future in engineering. Moreover, this industry must invest in skills for its own future so that it is able to keep delivering engineering services that are so critically required in this country," he added.

Turning to the information and telecommunications sector, Manuel said that while the Internet provides tremendous opportunities to change the way the South African economy works, it's not making use of these opportunities or continuing to innovate either.

"Six or seven years ago, South Africa was at the cutting edge of technology in the cellular phone business. We were using cell phones for purposes beyond what the original designers intended. Sadly, we are no longer at the forefront of cellular phone technology and India has overtaken us in using cell phones to bring services to the fingertips of everyone in that country.

"Regulatory failure has not only seen poor Internet penetration rates in South Africa but has also allowed costs to escalate disproportionately too. Worst of all, despite large profits, South African companies have not invested at a rate that is commensurate with the growth in this sector," he said.

Manuel says that in any sector or discipline it is essential that the state and the commercial markets co-exist particularly as the elected representative must not be seen to hand over power and responsibility to markets or to try to hold onto all the power themselves.

"Market alone will not provide all the solutions that South Africa needs and this underlines the fundamental point that the state and markets must co-exist. Thus, if a country does not have a public planning system then that country's elected representatives hand over these functions to private enterprise, which then holds the true seat of economic power," he said.

"We have a responsibility to plan for the kind of future we desire for all our people and it is this lack of planning capacity that prompted President Jacob Zuma to establish a National Planning Commission that will be comprised of about 20 smart South Africans from a variety of disciplines who will, on a part-time basis, give impetus to this expressed need," he added.

"Their task is to identify the needs, call for expert advice and guidance from researchers in a number of fields and to facilitate both a national consensus for the future of the country and then to facilitate decisions that can be taken by the Cabinet.

"The Green Paper on National Strategic Planning sets out what this approach should be," he said.

"I sincerely hope that all the engineering professions will mobilise their own resources and will stand up and make their voices heard on this critical planning matter," he added.

Watt's Says

Dear Sir,

I came across WATTnow (August 2009) by accident at the CNA the other day.

There are some great, thought-provoking, articles there.

Desertec: I really cannot see this getting off the ground, especially at the locations shown on the diagram. All of these countries are majority Muslim, and Islam is just like Communism in that it believes that its particular brand of slavery is the 'right' one. No European politician who wants to be re-elected (and they all do) could possibly agree to more than five to ten percent of their power supply in the hands of hostiles. No one in Europe is prepared to sacrifice any of his or her standard of living for what may be seen as 'third world deadbeats'.

Maybe a better idea would be to simply buy 10 000 square kilometres of Mauritania as well as a 50 km wide corridor through the Western Sahara. After all, it is only one percent of Mauritania and it is of no use to them. Who would want to live there is another question, because even Mauritanians don't. The area would have to be heavily defended with a permanent standing army, because the temptation to invade will always be there.

I fear that politics will kill the Desertec initiative, just as politics has prevented the majority of the world's population from living comfortably.

Secondly, how is it proposed to 'jump' the Straits of Gibraltar with electrical power? Are there plans for an undersea cable? It is noticeable that no one ventures to quote a cents/kWh delivered. Does anyone know? Are you sure that the technology is robust? For an alternative view of Spain's efforts to deliver 'renewable energy' see Alvaro Vargas Llosa, (BrookesNews.Com). As Newton might have said, if he were not so busy watching apples: 'Every opinion has an equal and opposite opinion.'

If the technology is robust, maybe South Africa should be doing it in the Kalahari. The Nersa buy-in price for solar-generated power is R2,10/kWh. That is the killer, isn't it? That is what the Greenies try to hide—that power generated from 'renewable' sources is far more expensive than power generated from hydrocarbons or nuclear. Are South Africans ready to pay that?

Angola: given Africa's post-colonial history, there can only be one answer—basket case. Again, the reason is politics.

Hydrogen: I fail to understand this issue. Intuitively, without doing calculations beyond my capacity, it does not seem logical that hydrogen can be produced by electrolysis of water, using a certain energy input, and that the same hydrogen can be burnt to generate more energy than was used to produce it. Also, fuel cells have been around for the whole of my working life (40+ years) and still there is no sign of commercialisation.

Tesla: I am surprised that when Science Minister Naledi Pandor asked for the name of a famous electrical engineer, the audience did not immediately leap up and shout 'Nikola Tesla'. But, then, he was not famous, was he? I guarantee that, of the first hundred people you ask on the street, you will be lucky to find even one who has heard of him. Yet they accept his innovations as part of nature—if they happen, fine; if they don't, they will never know the difference. Without him, our life today would be substantially different.

Isn't creativity amazing? A cup of water and the washing's done. It is easy to re-use bath water. Just install an elevated tank, block off the bath's waste outlet and use a submersible pump to transfer the water. Then pipe up to the washing machine and to the garden hose and bingo—one batch of water does at least two jobs. My grandparents had a rainwater butt, in the UK where it rains a lot of the time. I suppose that if we tried it here, we would receive a visit from the municipal health people, muttering about mosquito breeding grounds.

The point is that such creativity cannot happen in politically repressive countries. Which is why government is the problem, not the solution—but the more government fails, the more we get. Unfortunately, the majority of people still have a slave mentality, desperately looking for someone to tell them what to do with their lives. And there is always someone around to tell them. The catch is that the one who tells them does so with the intention of controlling them.

I note that some of the authors subscribe to the 'climate change' racket.

This scam is just the latest effort by totalitarians to re-enslave humanity—Socialism failed; Marxism failed; Keynesian 'economics' (with its strong socialist and Marxist overtones) has failed, and is still failing; The 'Club of Rome' failed; global cooling (remember that one?) failed; the ozone 'scare' failed (it was not 'cured' by the banning of chlorinated fluorocarbons—as far as I can determine, no scientist has ever induced a reaction between ozone and a CFC).

So this is the latest scam motivated by envy of the rich and to distribute poverty equally. Did you notice how African countries immediately claimed 'victim' status at Copenhagen? Why are so many people so determined to be regarded as victims? Surely that is not the way that we are supposed to live life. Of course, the phrase familiar to all such conferences—'give-us-the-money'—is there.

Did you see the article about repairing potholes in Citizen Motoring? I have seen trucks operating in Johannesburg, with a diesel generator. Now, if one of your bright sparks (pun intended) can design a power source to integrate with a truck (perhaps using Viv Alberts' thin solar panels), what a brilliant opportunity for an owner-operated self-contained SMME unit, working on contract to municipalities. The secret to successful repair is to integrate the repair with the surround—if a gap is left, water collects and tyre pressure soon starts a new pothole.

Regards
Peter Darley

Hi Paddy,

First and foremost may I congratulate you on a really informative magazine. I am not an engineer nor do I subscribe to your magazine, however I am very fortunate to have a friend who is an electrical engineer and I get his *WATTnow* every month when he's finished with it. The beauty is one does not have to be an engineer to understand the articles which I find extremely interesting.

I have a request that I am hoping you will be able to help with or at least point me in the relevant direction.

A year or so ago, I read in the newspapers that a bunch of students from either Wits or Johannesburg University had developed a new

type of photovoltaic cell that was absolutely revolutionary. I know that they have contracted a company in Germany to build this system for them. The gist of the invention is that unlike conventional solar panels, theirs is as thick as film and can therefore be rolled onto your roof tiles and look as though it is part of the roof. It was also much more efficient than the normal solar panel.

With Eskom just going crazy with their tariffs, I am interested in contacting them to size and price my premises. I realise that this is not really the best time to be asking this as we all go into silly season and with the universities already closed.

May I wish you and all the staff of WATTnow a blessed festive season and I look forward to next year's reading material.

Best regards,
Roger Chouler

Editor Replies: I personally don't know about this but I have published your letter and maybe someone can throw some light on this project.

Dear Paddy,

You may recall that I was one of the first to acknowledge the excellence of the New Look of the SAIEE magazine to your predecessor after the first issues landed on my doormat. Over the past couple of years my views have not changed; you continue to go from strength to strength as your mailbox will confirm.

Your November issue gave some detail of the work of Charles Kao on the occasion of his award of the Nobel Prize for physics for his pioneering research into transmission of signals over dielectric fibres. Perhaps you will allow me to add some of the earlier background to this.

Charles Kao joined STC (Standard Telephones and Cables) in their Transmission Laboratory at North Woolwich and took his first degree at Woolwich Polytechnic three years after me. Woolwich Poly, as it was familiarly known at that time, 1953, was an internal college of London University and was ideally situated among several large companies in the telephone business in south-east and east London.

Many of my old colleagues went through there especially as these companies offered what was known as Sandwich Programmes in which one divided one's employment half and half between the Poly and the Company. It was an ideal way to take a good engineering degree particularly if you were not very well off, as many of us were not.

Anyway, Charles got his engineering degree there and shortly after that he went on to do his PhD at University College London. From there he went back to STC to their research labs STL at Harlow, not far from Woolwich.

His research project was to study propagation over surface waveguides.

His was the seminal paper presented, jointly with G A Hockham, to the IEE entitled *Dielectric-fibre surface waveguides for optical frequencies*, which was published in the Proc. IEE in July 1966. I have a copy of it before me as I write. This was all done while the British Post Office, mindful that high speed broadband transmission was becoming vitally necessary, were looking into buried millimetric waveguides.

I think it says a great deal about the faith of a great company like STC to invest in such a venture especially when early measurements indicated losses of many dB over lengths of one metre. Perseverance with material, cross section geometry and study of modal behaviour, followed by the engineering of manufacturing techniques including clean room disciplines enabled the technology to proceed to the point where the first working optical fibre cable was put into operation by STC between Hichin and Stevenage in the UK, a distance of 9 km, in 1977.

Today, of course, many contributors have brought this hugely successful enterprise to the point where attenuation can be redefined in millibel (mB) units and where we will never look back to the old days of long distance coaxial cable with repeater spacing down to two kilometres and the resulting reliability problems that could ensue.

With best regards,
Bill Brading

Hi Paddy,

I don't totally agree with your footnote response to Jean Thomas Lokala J'Ifaso's article on Inga-Three (*WATTnow*, November). There are other dimensions to this issue.

For any engineering project there are a number of stages:

Firstly, *Strike while the iron is hot!* The first, brainstorming stage of the Inga-Three/Westcor project was accomplished, and the outcome seemed promising. At this stage, seemingly, Dr Ian McRae retired from Eskom, leaving the tentative scheme without a 'champion', who would be needed to drive it ahead against all critics.

Secondly, there is a need for a detailed engineering study of the proposal, to verify its real-world feasibility, particularly the economic aspects, but also to identify any potential problems (technical, political or others) with operation and maintenance of the system. Such a study costs MONEY.

It seems that Eskom, as a major potential partner failed to kick off this phase: Jean Thomas indicates that he was unable to persuade Jacob Moroga to procure the necessary finance from Eskom for this stage. Finally, only after successful completion of the first two stages, can the scheme advance to the construction and operation phases.

In the present *Blame Eskom for everything* era, this seems to be just another case where Eskom management fell down on their job. The role, if any, of the South African government in all this is unknown. It seems out of place to blame the DRC government for picking up a fall-back opportunity, after one of the prime instigators of Westcor (this is Eskom) ostensibly lost interest in it.

DRC needed to *Look after number one!*: hence their acceptance of the Billiton smelter alternative.

Regards
Tony Fisher - Retired Member, SAIEE

Editor Responds: In my footnote I said that the DRC had chosen a deal withBilliton rather than regional co-operation with the other members of Westcor. I think that point remains, and is well made because, as Tony says, the DRC is looking after itself.

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Herschel telescope is brought back to life

The billion-euro Herschel Space Telescope is once again working properly after engineers managed to remotely repair its Heterodyne Instrument for the Far Infrared (HiFi) high-resolution spectrometer that was turned off just three months into the mission because of an anomaly probably caused by space radiation.

The Dutch-led consortium that operates HiFi has now switched the instrument to its reserve electronic systems and apparently the problem that caused the malfunction has now been fully understood and prevented from happening again.

According to Dr Frank Helmich, from the SRON Netherlands Institute for Space Research and lead scientist on the HiFi project, the team of 30 people had to carefully trace exactly what had caused the original malfunction and then remotely rectify it.

The European Space Agency's telescope was launched in May last year and is positioned 1,5-million kilometres from earth. Its instruments are used to sense far-infrared and sub-millimetre radiation.

The fault was eventually traced to a faulty diode in a Local Oscillator Control (LCU), which is part of the system that helps process the signals received by the instrument.

The cause of the failure has been attributed to a cosmic ray hitting a microprocessor and this triggered a series of hardware and software actions that resulted in a powerful voltage being sent through the LCU, destroying the diode.

Helmich referred to it as a very complex technological problem. The HiFi unit has redundant electronics built into it and the instrument is now using its reserve LCU. Measures have apparently been put in place to ensure that the fault cannot recur.

The Herschel telescope has a 3,5 metre (diameter) mirror and is the largest to have flown in space. It can probe clouds of gas and dust and will be used to see how galaxies have evolved over time. The mission will come to an end once the helium refrigerant boils away.

Image courtesy of ESA.

Plastics made from starches or algae

Bio-plastics made from vegetables and plants could replace petroleum-based products if the price of oil rises to above $95 a barrel claims Frederic Scheer, the owner of Cereplast, a company that designs and makes sustainable plastics from starches found in tapioca, corn, wheat and potatoes.

He says that when the price of oil reaches $95 a barrel, sustainable plastic products become a cheaper option. Scheer is confident that the oil price will rise to at least $95 a barrel by 2013, and when it does, major companies such as Du Pont and BASF will adopt his technology.

It might be wishful thinking, particularly as the demand for oil may fall over the next few years as alternative fuels become cheaper and more readily available. However, demand for plastics is likely to remain high. The world market for petroleum-based plastics is currently worth about $2 500-billion a year.

Cereplast has accumulated a series of patents for its bio-plastics technology over the years and, while it is a small company, already has annual sales worth about $5-million.

Its resins, which are bio-degradable, are used in products such as cups, plastic lids and other packaging.

Cereplast's 'hybrid' resins of polypropylene are apparently stronger and more durable than petroleum-based resins and are used in vehicles and to make children's toys.

Scheer says that one kilogram of petroleum-based polypropylene creates 3,15 kgs of carbon dioxide compared with bio-propylene, which creates just 1,4 kgs of carbon dioxide.

Around 70 percent of plastic waste ends up in landfill sites rather than being recycled.

Cereplast is currently working on a new technology to produce bio-plastics from algae, which grows extremely quickly, in large quantities and at a lower production cost.

Scheer says that plastics made from algae will be available before the end of this year.

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More than 5-million Internet users in SA

South Africa now has more than 5-million Internet users and this figure is expected to reach more than 6-million by the end of 2010 according to statistics compiled by World Wide Worx. Last year Internet usage grew by 15 percent.

Company managing director Arthur Goldstuck says that growth in the number of Internet users in South Africa was relatively stagnant between 2002 and 2007 when it stayed below seven percent a year, but this figure almost doubled in 2008 and continued to accelerate in 2009.

Goldstuck attributes the spike in growth to the granting of new Electronic Communications Network Service licences to more than 400 organisations throughout the country. This allowed major providers to build their own networks or choose where they wanted to buy access.

He says the result was that the market, previously characterised by a limited range of providers and services, suddenly exploded, as small providers were able to repackage services in any way they chose.

The second factor was the improved penetration of broadband connectively by small and medium enterprises that were migrating from dial-up connectivity. For instance, each company moving from dial-up to ADSL extended Internet usage across all office staff and resulted in an additional one to 20 new users for every small business installing an ADSL line or similar broadband solution.

Goldstuck says that in the coming year, new operators will start to leverage the benefits of new undersea cable capacity and new fibre-optic networks to supply corporate clients and resellers with bigger, faster and more flexible capacity.

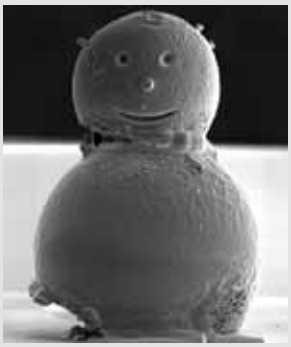
He says the year ahead will see a proliferation of high-speed connectivity materialising more widely than ever before.

Smallest 'snowman' ever made

Scientists at the National Physics Laboratory in London created a miniature 'snowman' just 0,01 mm wide using tools designed for manipulating nano-particles.

It was made from two tiny tin beads, normally used to calibrate electron microscope lenses, which are welded together with platinum. A focused ion beam was used to carve the 'snowman's eyes and smile and to deposit a tiny blob of platinum on the face for the nose.

Dr David Cox, a member of the Quantum Detection group working at the laboratory, made the 'snowman'. The National Physics Laboratory is one of Britain's leading science facilities and research centres.



It's hardly surprising that Cox decided to make a 'snowman' considering that Britain is currently experiencing it's coldest winter in more than 50 years, prompting some people to believe that this is symptomatic of the effects of climate change.

Ethiopia's new power plant onstream

Ethiopia has finally commissioned its controversial hydroelectric power plant on the Omo River that is part of it plan to create a cascade of dams to provide affordable power to a country that has been crippled by a shortage of energy.

The latest phase, Gilgel Gibe II will be able to generate more than 400 MW of electricity using water that is fed to the plant from an underground channel that extracts water from the Omo River.

The next stage of the project will see Gilgel Gibe III coming on line, a plant that will eventually be capable of generating 1 800 MW of electricity. Some of the power generated from the hydroelectric power stations will be exported to Djibouti, Kenya and Sudan.

Ethiopian authorities hope that electricity exports will soon replace coffee as the country's largest export revenue earner.

SANEA

The South African National Energy Association

Energy People Working Together

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

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

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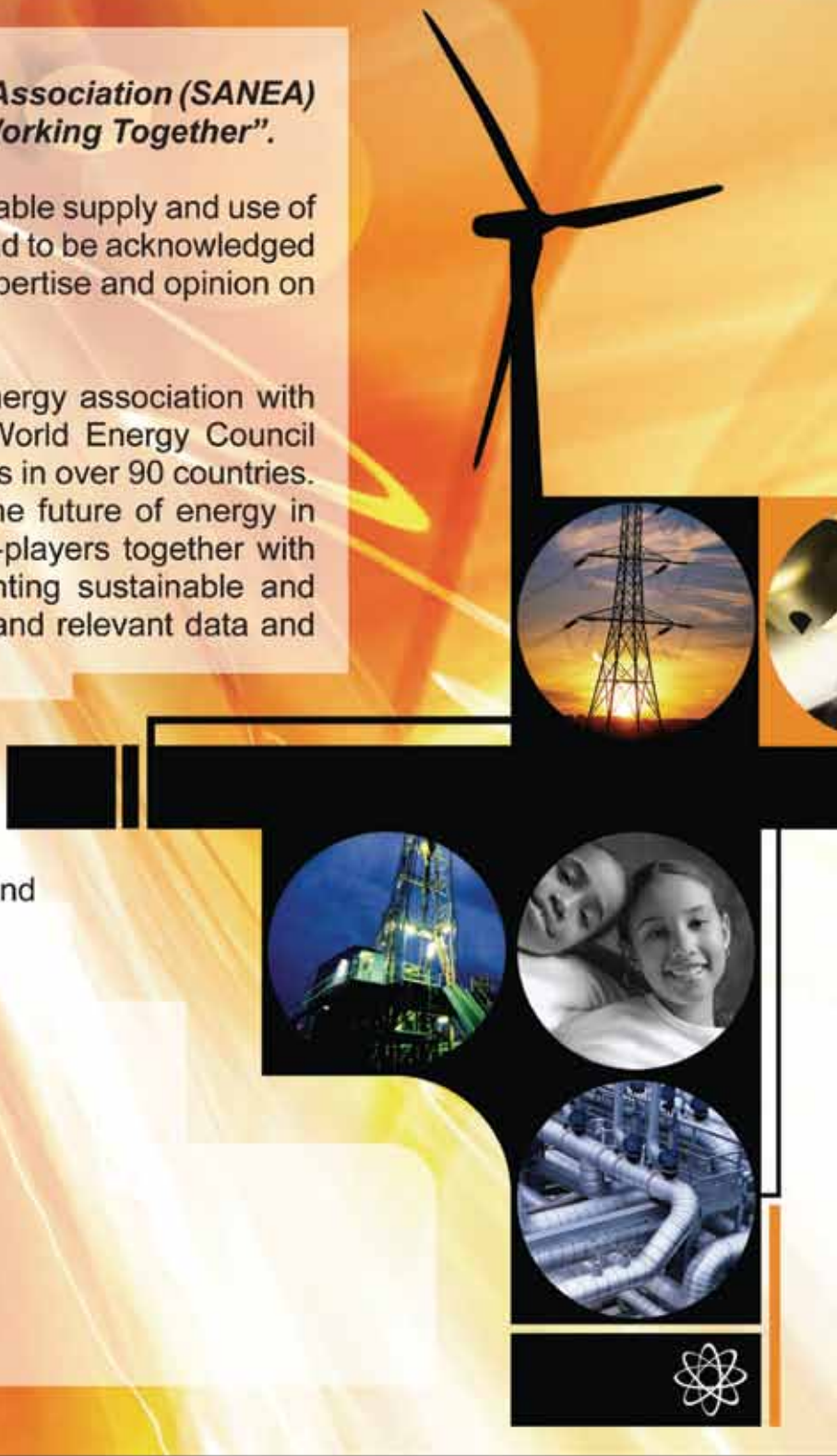


Virgin Galactic and its commercial spaceship

Virgin Atlantic's boss, Richard Branson, has unveiled plans for the world's first commercial passenger spaceship. The sleek black-and-white vehicle will be ready to fly within the next two or three years.

Branson says a $450-million budget for six of these planes has been set aside and the mini-van-sized SpaceShip Two will carry passengers into near-Earth orbit that is high enough to achieve zero gravity and weightlessness.

A twin-hulled aircraft called Eve will carry SpaceShip Two to an altitude of 60 000 feet (18 288 metres) before releasing the spacecraft. It would then fire its onboard rocket engines, climbing to an altitude of 65 miles (104 676 km).

The trip into space would take about two-and-a-half hours and passengers would spend about five minutes in a weightless state. The price of each flight has not yet been revealed but already more than 300 people have paid a $200 000 deposit for the journey.

Branson says that eventually, Virgin Galactic (an offshoot of Virgin Atlantic) might soon offer sub-orbital intercontinental flights that will dramatically cut the length of current commercial flights such as a two-hour flight from Los Angeles to Sydney.

Several years ago he hired aircraft designer Burt Rutan and his team at Scaled Composites to build the commercial spaceship having successfully designed and built SpaceShip One, a vehicle that won the $10-million Ansari X Prize in 2004 for the first privately piloted space flight.

SpaceShip One made three sub-orbital flights.

SpaceShip Two has already undergone its test flights inside the Earth's atmosphere and the next goal is to start with extensive test flights into space before the commercial service is offered to paying passengers.

All passengers would have to undergo a three-day training course prior to the flight.

Several wealthy people, including South African Mark Shuttleworth, have already travelled into space and spent a week on the International Space Station. These trips cost in the region of $20-million each.

Undersea volcanic eruption captured on video

High definition video images of the West Mata submarine volcano, about 200 km south-west of Samoa, show microbes and shrimps living in this hot, extremely hostile and acidic environment, which has a pH of 1,4.

Molten lava streams into the sea at a temperature of about 1 400 °C and the resulting magmatic gases provide energy for microbial life and these microbes are a food source for the deep-sea shrimps.

Scientists in the United States developed a robotic submersible, Jason, that was used to film the volcano at a depth of 1 100 metres. The West Mata volcano is about 9 km long and 6 km wide and its base is about 3 km below the surface of the sea.

It is close to the 10 000-metre-deep Tonga-Kermadec Trench where the Pacific Tectonic Plate dives under the Australian Plate.

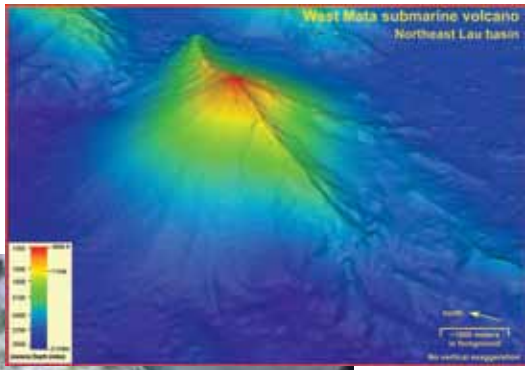
The existence of this volcano's eruption was identified in 2008 using water samples recovered from the ocean. The samples contained high levels of hydrogen and volcanic debris.

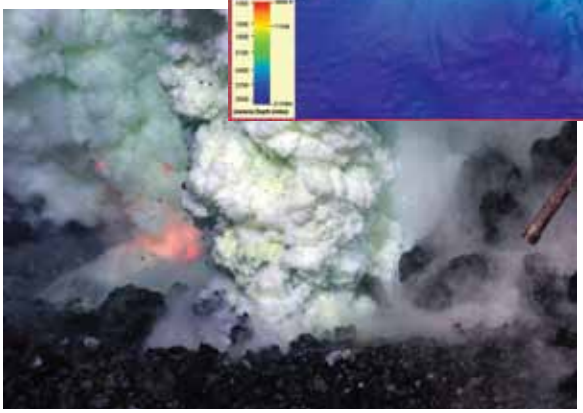
The Woods Hole Oceanographic Institution (WHOI) developed the robotic submersible and it was able to film the lava flows from just 3 m away, capturing large molten lava bubbles, each about a metre wide, bursting into the cold sea water.

Two robotic arms collected samples of rocks, hot spring water, microbes and shrimps.

According to Tim Shank, a macro-biologist at the WHOI, the shrimp have modified eye forms and modified claws that allow them to scrape up certain types of bacteria.

Researchers say that the West Mata volcano is spewing boninite lavas, which are believed to be among the hottest lavas on Earth and of a type only seen in extinct volcanoes that are older than a million years.





Orange glow of magma from West Mata submarine volcano. Image: NOAA.

British government to tax the Internet

The British government is to start taxing users of the Internet by charging a levy of £6 a year on all households and businesses with a fixed-line phone and it would surprise me if South Africa's Finance Minister Pravin Gordhan did not include such a suggestion in this year's budget.

Money from the controversial fixed-line levy, according to Britain's Chancellor of the Exchequer, Alistair Darling, will be used to fund a super-fast broadband service for all households in the UK by 2017.

Darling says that the UK's digital infrastructure is being overhauled, creating thousands of jobs for skilled people and providing a full suite of broadband services to even the most remote regions of Britain.

The broadband tax has received widespread criticism from experts in the telecommunications industry who say that the levy will not provide nearly enough money to the government for it to undertake a comprehensive revamp of the industry.

British Telecommunications is currently rolling-out its next-generation broadband infrastructure to about 40 percent of the homes in the UK and Virgin Media is now offering its customers speed up to 50 megabits per second.

The Conservative Party's shadow culture secretary, Jeremy Hunt says that his party favours a market-led approach rather than using public funds to upgrade the telecommunications infrastructure.

Most of the remote rural areas of the UK do not have broadband telecommunications services and rely on the older technologies such as dial-up modems to connect to the Internet.

Americans suffering information overload?

Modern-day people are being bombarded with so much information that it would probably overload the average laptop computer according to scientists at the University of San Diego, California who found that the information overload might be causing brain damage.

The study says that the strain of processing so much data means that individuals are becoming more and more disconnected from their peers and developing shorter attention spans.

The study measured information bombarding consumers in the United States in and outside the home in non-work related activities. It included going to movies, listening to the radio, talking on a mobile phone, playing video games, surfing the Internet and reading newspapers among other things.

According to Roger Bohn, co-author of the *How Much Information* study done by the Global Information Industry Centre, the total number of words 'consumed' in the United States more than doubled from 4 500-trillion in 1980 to 10 845-trillion in 2008. The estimates exclude people talking to each other.

Total information consumption on televisions, computers and other media was estimated at 3,6-zettabytes (3,6-million gigabytes). The daily intake of words is equivalent to 34-gigabytes, enough to overload a typical laptop computer in a week.

Through e-mail, the Internet, television and other media, people are deluged with about 100 500 words a day or 23 words a second. The study suggests that traditional media such as radio and television still dominate information consumption.

Bohn says that never before in human history has the brain had to process as much information as it is currently doing in many of the modern cities around the world.

The study confirmed that a large chunk of the day is spent watching television, DVDs, recorded shows or real-time programmes. Americans watch 36-million hours of television on mobile devices each month. About 80 percent of the population plays some kind of computer game every day.

Touch screen computers cost just $100 each

A new tablet computer aimed at allowing children in developing countries to inexpensively and easily connect to the Internet has been launched in the United States. The XO-3 is a slim-line, touch screen tablet computer.

It is the latest addition to the One Laptop Per Child (OLPC) initiative and will sell for about $100. It will be available for distribution in 2012 and will replace the existing XO-2, a foldable e-book computer that has now been scrapped by the organisation.

The OLPC initiative aims to sell low-cost $100 laptop computers in lots of one million to governments in developing countries. However, governments in these regions have refused to spend money on the bulk orders and because of this the OLPC is now offering single units to school-children in developing countries at just $200 each.

The computers are able to run Linux or Windows operating systems.

So far 1,4-million laptops have been distributed to children in 35 developing countries around the world.

Uruguay enthusiastically joined the programme and the Uruguayan government bought a computer for every child at school in that country. Walter de Brouwer, chief executive of OLPC Europe says that saturation projects such as this are the future for the organisation.

Other countries have been slow to join the OLPC project and while some computers have been sold to schools in Africa there is still no clear indication of exactly how many children are using these machines.

The new XO-3 tablet computers use touch screen technology, have an inbuilt camera, an induction charger and a chip made by ARM. Governments in developing countries are able to qualify for a discount on bulk orders and can pay the computers off over a number of years.

Bristol university hatches cryo-egg

Bristol University scientists have developed a cryo-egg that will be buried deep into the Greenland ice sheets and will beam data about how frozen water is moving into the sea back to scientists working on the surface.

A team of researchers at Bristol University won a £225 000 grant from the Natural Environment Research Council to build the egg.

Project leader and geographical scientist, Dr Jemma Wadham says the technological challenges in building this egg were immense as it will have to survive the crushing forces exerted on it by the moving ice. It also needs to be able to communicate with scientists through kilometres of ice.

She says that because glacial ice moves, the use of cables was ruled out because these would eventually snap. So the team has developed a wireless solution that will not only provide data on how ice moves but will monitor the largely uncharted subterranean landscape.

The egg's name is derived from cryogenics or the study of low temperatures.

Ice sheets cover about 15 percent of the surface area of the planet. In Greenland, ice gets pushed down under its own weight and this force squeezes ice outwards. The motion of the ice is thought to depend on how it is lubricated by water at the point where it meets solid ground.

The cryo-egg will help scientists solve this puzzle.

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Hydrocarbon lakes exist on Titan's surface

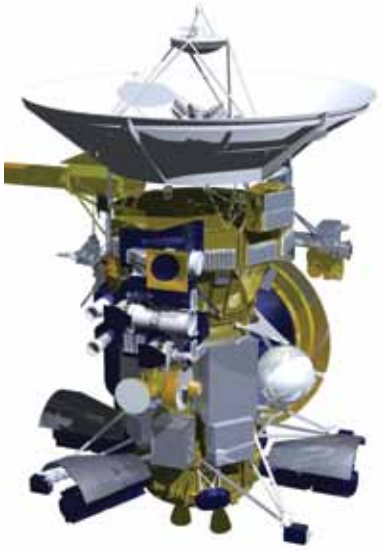
The Cassini spacecraft observing Saturn's moon, Titan, has captured high resolution images of sunlight reflecting off a lake, confirming the presence of liquid hydrocarbons on Titan's surface.

Scientists at the University of Arizona in Tucson were able to pinpoint the reflection coming from the Kraken Mare lake, which covers an area of about 400 000 km and is larger than the Caspian sea, the largest lake on Earth.

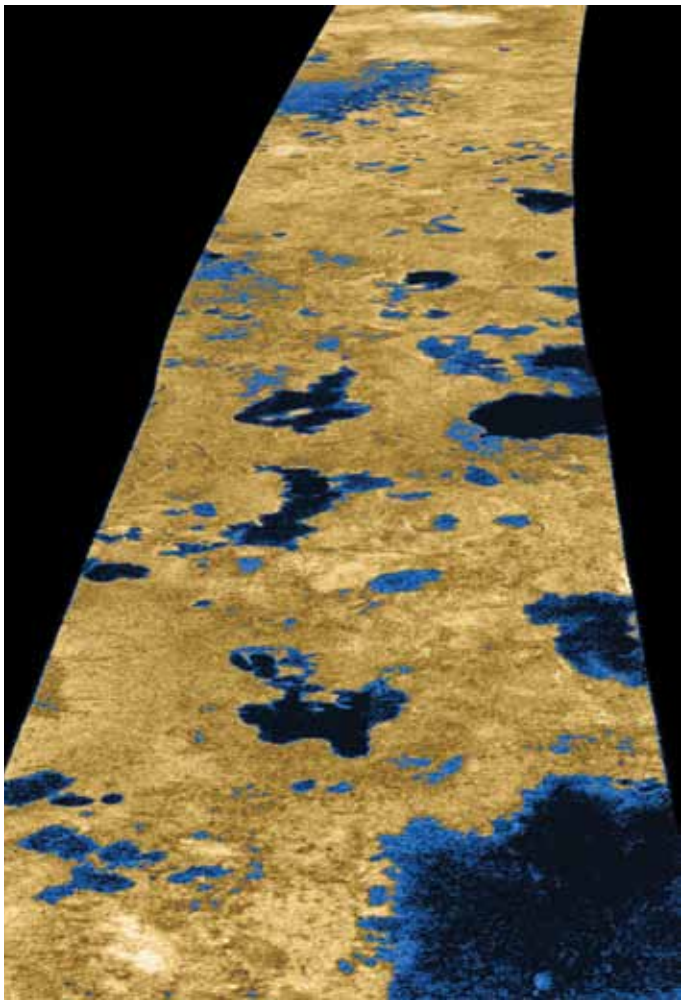
The shoreline on Kraken Mare has been stable over the past three years while Titan itself is in a hydrological cycle that brings liquids to the moon's surface.

Cassini project scientist, Bob Pappalardo, says the images – known as a specular reflection – clearly show Titan's thick atmosphere and the presence of surface lakes similar to those found on Earth.

Titan is Saturn's largest moon and for more than 20 years scientists have theorised that the cold surface could host seas or lakes of liquid hydrocarbons making it the only other body in the solar system to have liquid on its surface.

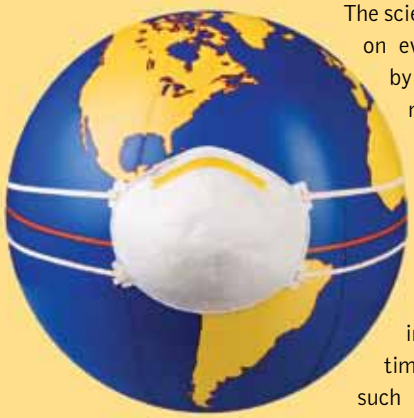


Large lakes have been spotted at Titan's north and south poles. Using infrared data captured in 2008, scientists were able to confirm the presence of liquid in Ontario Lacus, the largest lake in Titan southern hemisphere but they are still looking for evidence that similar lakes exist in the northern hemisphere where lakes of methane have been spotted.



Effects of greenhouse gases under-estimated?

A new study by scientists at Bristol University suggest that the Earth may be 50 percent more sensitive to the warming effects of carbon dioxide greenhouse gases.



The scientists have based their study on evidence from data obtained by studying the Pliocene epoch more than three million years ago when global temperatures were between three and five degrees higher than they are today.

The scientists claim that the levels of carbon dioxide in the atmosphere at that time would not have produced such a warm atmosphere. The scientists compared temperature reconstructions from sediments in the ocean floor with a global climate simulation model, which aimed to map the climate three million years ago.

Study leader, Dr Dan Lunt, says that the Earth may be between 30 percent and 50 percent more sensitive to atmospheric carbon dioxide than experts have predicted up to now. Such a discrepancy could be explained by long term changes in vegetation and ice cover.

Using data based on the concentrations of carbon dioxide during the Pliocene period Lunt says that the climate modelling statistics indicated that there was a significantly smaller temperature increase than was shown in the reconstruction.

This led him to review the climate modelling procedures and he now warns that existing climate models used by organisations such as the Inter-governmental Panel on Climate Change fail to take into account the full effects of carbon dioxide on the Earth's atmosphere.

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CROWN PUBLICATIONS

Gamburtsevs mountain range mapped

Scientists have mapped one of the strangest mountain ranges on Earth after analysing data collected from a surveying project over the Gamburtsevs in Antarctica. The mountain range is buried beneath the Antarctic ice cap.

The mapping project was completed last year and only now has the data been sufficiently analysed to provide clear results of what this mountain range is like. Apparently it is more linear in shape than was expected and it is much more jagged as well.

According to Dr Michael Studinger from the Lamont-Doherty Earth Observatory (LDEO) of Columbia University, New York, the linear structure of the range means that the mountains should be like the Alps or the Appalachians.

He says that these ranges are formed by the collision of tectonic plates. However, scientists have speculated that the Gamburtsevs might be old 'hot spot' volcanoes that had punched their way through the Earth's crust much like the Hawaiian Islands have done.

The range has fascinated scientists for years because it seems it is almost certainly a nucleation point from about 30-million years ago for the huge ice sheets that now cover the entire Antarctic continent. It's particularly difficult to study this range where temperatures drop below -80 °C.

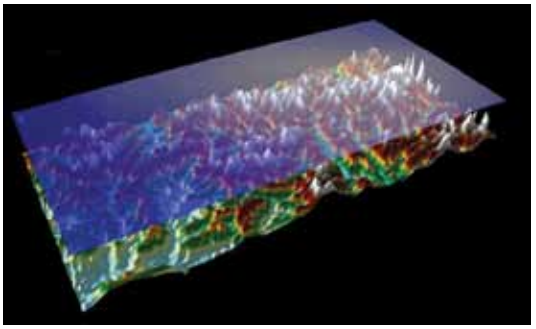
Now that scientists have completed the full aero-geophysical survey and mapped the entire range, some clues on the origins of the mountains may be found. The mapping was done using two instrumented Twin-Otter aircraft flying out of remote field camps, collecting data as they flew.

The planes criss-crossed the hidden peaks, flying a total of 120 000 km. They gathered data on gravity, magnetic and ice thickness, took radar images of the rock bed and the layers within the ice and made a map of the ice-sheet surface with a laser.

The most shallow layer of ice is just several hundred metres thick while the deepest ice detected is about 4 800-metres thick. The mountains themselves rise about 2 500 metres above sea level.

The data reveals high peaks and deeply incised valleys indicating that both water and ice processes have been at work over thousands of years. Pockets of liquid water have been detected at the base of the ice but researchers are not sure of the reasons for this or how the ponds of water might be interconnected.

Liquid water was found in the very centre of the ice sheet. It is thought that parts of the ice are between 1,2-million and 1,5-million years old.



Does a corpse represent a health risk?

With the death toll in earthquake-stricken Haiti now estimated at 200 000 and corpses being dumped into open pits or left to rot inside collapsed buildings there have been fears of serious outbreaks of disease in Port au Prince and other centres where Haitians died.

However, Sir Nicholas Young, head of the British Red Cross recently discounted fears that dead bodies or rotting corpses will spread disease even though he concedes that the smell of decaying flesh is particularly unpleasant, even nauseating.

He points out that the Red Cross set up its own guidelines on cadaver management based on recommendations from the Pan American branch of the World Health Organisation, which has published a paper entitled *Management of Dead Bodies After Disasters: A Field Manual for First Respondents.*

This guide was compiled after several disasters, including the 2004 Asian tsunami, Haiti's 2004 floods, hurricanes Katrina and Stan and the earthquakes that struck northern Pakistan and India.

The guide is based on research by Oliver Morgan of the London School of Hygiene and Tropical Medicine that clearly proved that dead bodies found after natural disasters do not pose any threat to public health.

His research showed that temporary burial is recommended but the use of caustic chemicals used to supposedly disinfect the bodies are not to be used as these make identification of the corpses even more difficult.

He says that in disasters such as the earthquake in Haiti, most of the people killed will have been in a healthy state. According to the guidelines, people clearing dead bodies should take precautions against some diseases, such as tuberculosis, Hepatitis B and C, diarrhoeal disease and HIV, which can last up to six days in a corpse.

Morgan emphasised though that the dead person would have had to contract such a disease prior to his or her death.

According to Morgan, the deep-seated belief that bodies must be disposed of quickly probably stems from previous epidemics where people actually caught the disease from the person who had died recently as happened in some of the cholera outbreaks.

WATTnow

CPD Overview

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

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

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

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

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

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

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

For further information visit www.wattnow.co.za

New Delhi jail going green

The largest jail in south east Asia, the Tihar central prison in New Delhi is likely to be the first 'green' prison in the world, using renewable energy, recycled waste and cutting its electricity consumption dramatically.

The prison comprises ten blocks and covers an area of 160 hectares and it is hopelessly over-crowded, holding 11 500 inmates, nearly double its authorised capacity.

The prison's director-general, BK Gupta, plans to improve living conditions for inmates, most of whom are awaiting trial. He says the prison has the space to set up its own gas plant to meet its energy needs and is already using rainwater harvesting systems to augment the ground water resources.

Piped natural gas is being used in the kitchens at the Tihar complex.

Two sewage treatment plants are being built to recycle water for horticultural purposes and the government has allocated 9,65-million Rupees to the greening project.

Kitchen waste will be recycled in four biogas facilities set up close to the kitchen complexes. The prison currently spends about 45-million rupees a year on electricity and it plans to reduce this dramatically by using biogas.

A solar-powered heating system will be used to provide 30 000 litres of hot water a day. Elsewhere in the complex, low-energy light bulbs are being used in the cells and infirmary.

Fans will also be turned on throughout the prison complex during the day when temperatures rise to 50 °C causing some prisoners in Asian jails to die of asphyxiation.

China's power to (reach) the people

China has introduced legislation that forces all electricity power grid operators to buy all electricity produced using renewable energy resources. The amendment to the 2006 Renewable Energy Law has been adopted by the standing committee of the National People's Congress.

There has been a boom in wind-power plants in China mainly as a result of government subsidies to producers of renewable energy but as much as 30 percent of these wind plants are not connected to the national grid.

According to Wang Zhongyong, renewable energy director at the National Development and Reform Commission's Energy Research Unit, renewable power in the under-developed north western region should be carried to resource-scarce regions such as the prosperous coastal resorts in China.

He says that the relative independence of regional grids in different provinces and municipal areas has made it difficult for power producers to sell excess electricity to the grid owners. As a result, renewable power is being wasted rather than used.

China authorities have been urged to develop smart grids by the local Institute of Electrical Engineers at the Chinese Academy of Sciences. It says that smart grids offer essential technology that can optimise the use of electricity throughout the country.

In terms of the new law, grid operators who do not buy renewable energy will be fined up to twice the amount of the loss suffered by renewable energy generators.

China hopes to have 15 percent of its total power generation coming from renewable energy resources in the next ten years, up from about nine percent currently.

It also has a target for its carbon intensity – the amount of carbon produced per unit of gross domestic product – of between 40 and 45 percent by 2020, compared with similar figures in 2005.

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Paper batteries may soon be available

Ordinary paper might be used as a lightweight battery to power electronic devices such as e-book readers, computers or sophisticated mobile phones. Scientists at Stanford University in California have coated paper with a special ink made from silver and carbon nano-particles to create the battery.

Scientist Yi Cui says that silicon nano-wires could be used to make batteries that are ten times more powerful than the lithium-ion batteries being used in electronic devices today.

Cui says that using conductive paper as current collectors and electrodes means that paper super-capacitors can be used in all sorts of applications that require instant high power.

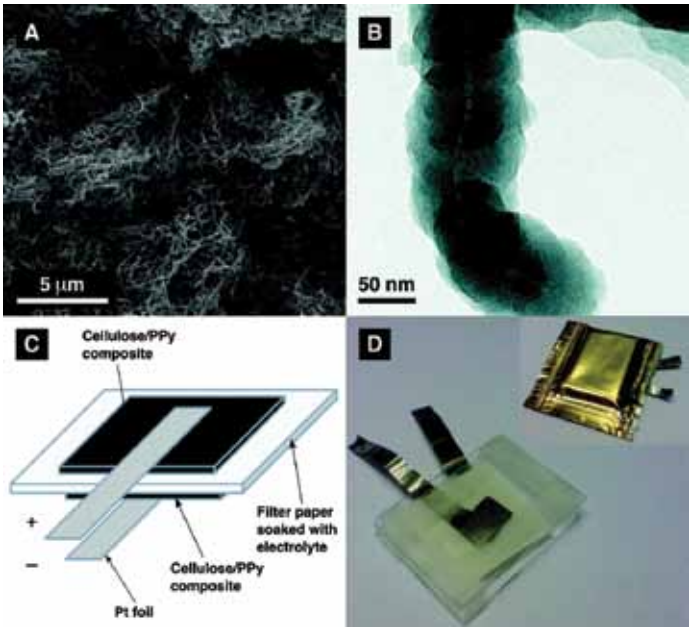
The same feature that helps ink stick to paper allows it to hold onto single-walled carbon nano-tubes and silver nano-wires.

Cui says that this type of battery is much lighter and longer lasting than existing batteries and the technology could even be used on electric and hybrid vehicles to store power for sustained periods.

He says that societies throughout the world need low-cost, high-performance energy storage devices such as batteries and simple super-capacitors.

He believes that the technology will be commercialised within the next few years and will lead to much lighter electronic devices that maintain power for much longer than they currently do.

The findings of the Stanford University researchers have been published in the Proceedings of the National Academy of Sciences.



Images from an experimental paper-based battery.
Image: The American Chemical Society.

This Phoenix might not rise again

The Phoenix Mars lander may have endured the Martian winter but scientists doubt that they will be able to resurrect it so that it will once again start sending radio signals back to Earth.

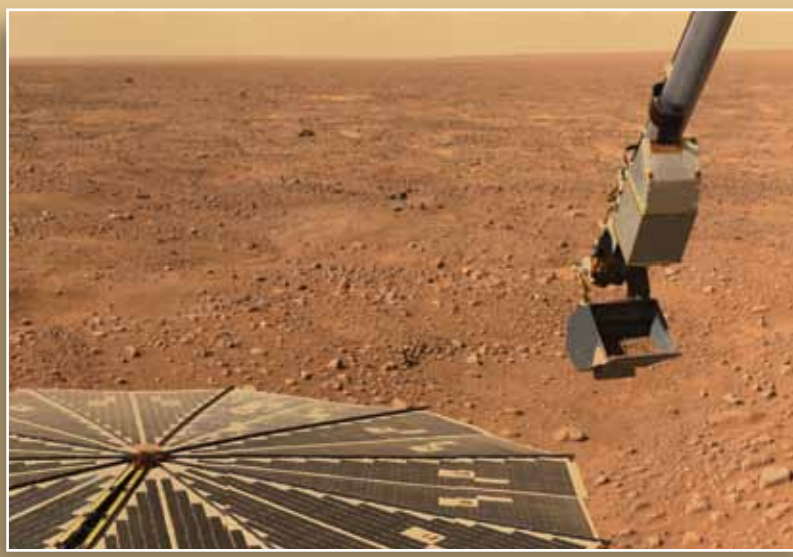
Phoenix's last communication with Earth was on 2 November 2008 when it had completed its study of an arctic Martian site. Since then the landing site has gone through Mars' autumn, winter and the first part of early spring. However, scientists doubt that the craft will have survived the temperature extremes that occur on the planet.

They suspect the electronic components will have broken up because of the freezing temperatures. However, the Odyssey orbiter has been programmed to listen for signals from the Phoenix lander roughly ten times a day for three days in January and then for two longer listening campaigns in February and March.

Chad Edwards, chief telecommunications engineer for the Mars Exploration Programme at Nasa's Jet Propulsion Laboratory in Pasadena says that if Phoenix is transmitting, even faintly, Odyssey will pick up the signals.

Scientists from the Mars Exploration Programme will also perform a number of contact attempts so see if any communication can be re-established so that Pheonix can start transmitting again.

Scientists are concerned that Phoenix's batteries will not have been able to withstand the extremely cold Martian winter where temperatures reach -120 °C, cold enough to form carbon dioxide snow.



This image shows NASA's Phoenix Mars Lander's solar panel and the lander's Robotic Arm with a sample in the scoop. The image was taken by the lander's Surface Stereo Imager looking west during Phoenix's Sol 16 (10 June 2008), or the 16th Martian day after landing. The image was taken just before the sample was delivered to the Optical Microscope. This view is part of the 'mission success' panorama that will show the whole landing site in colour.
Image: NASA/JPL-Caltech/University of Arizona.

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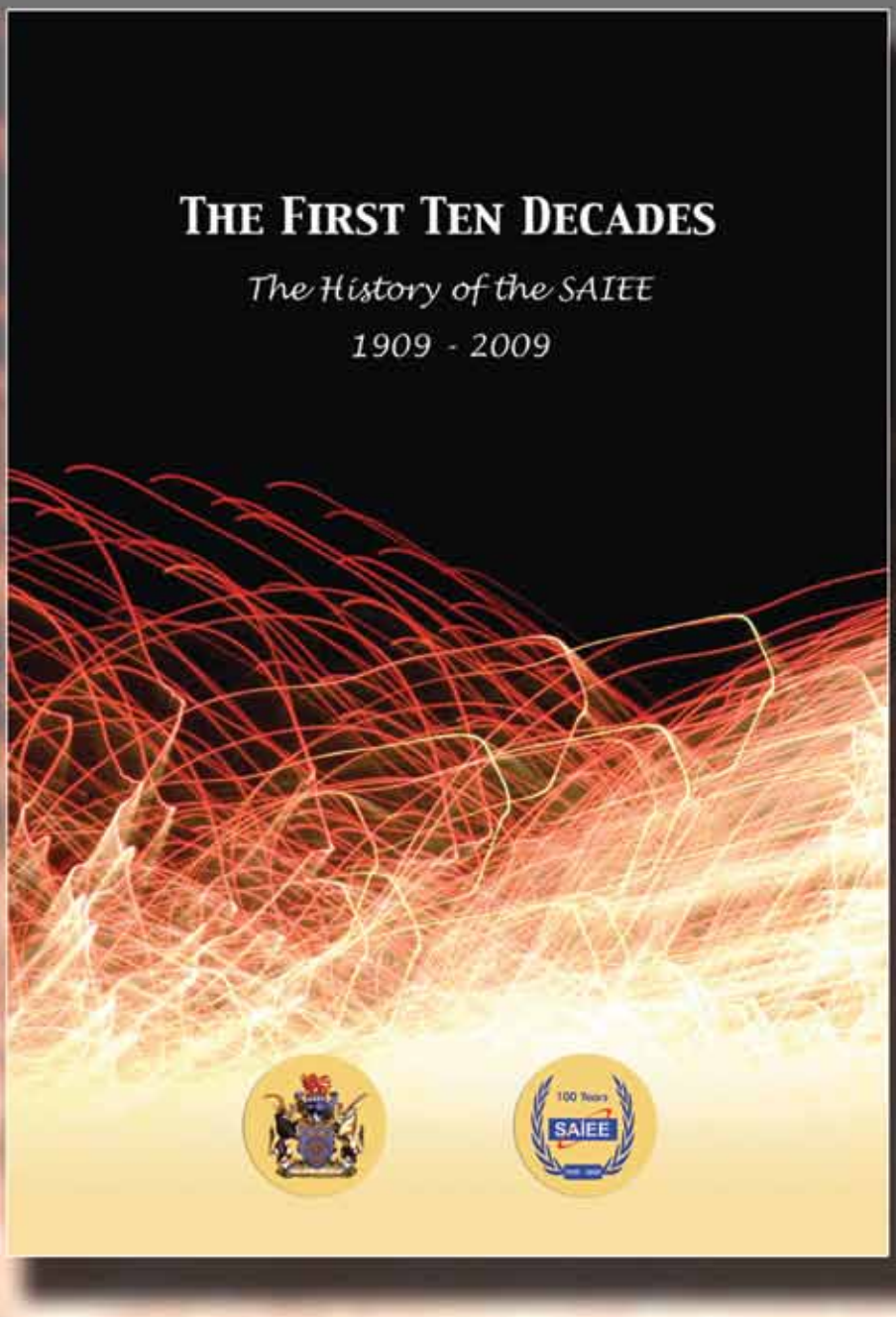

FROM THE CENTENARY PRESIDENT ...

du Toit Grobler

du Toit Grobler looks at the past year and the year to come.

On 1 January 2010 the world entered the second decade of the 21st Century and the SAIEE entered its second century of existence.

I hope each of you will enjoy a peaceful and prosperous 2010. Last year, 2009, was a special and equally successful year for the SAIEE. We celebrated the first hundred years of the SAIEE in many appropriate ways and set the scene for the second century of the SAIEE, which will continue to recognise the challenges that will come its way and drive those to commendable achievements. From the Centenary President, a very special word of appreciation to each and every one who in any way has played a role in the success of the celebrations.

Final event of the 2009 Centenary celebrations

The final event of the 2009 Centenary celebrations was the planting of a Centenary Memorial Tree, which took place after the final Council Meeting of 2009 on 4 December 2009. The tree, which was planted by the President, is a Black Monkey Thorn / Swart Apiesdoring / *Acacia Burkei*. It was planted on the west side of Innes House from where its shadow will, in years to come, provide some cooling from the hot afternoon summer sun on the Witwatersrand.

Final council meeting of 2009

In addition to normal business, two special items were dealt with at the SAIEE's last council meeting held in December. First, the President presented Viv Cohen, recipient of the SAIEE 2009 Engineer of the Year Award, with the award that he was unable to accept at the Centenary Banquet. Secondly, the SAIEE 2010 budget was presented to the meeting and after constructive debate, was approved, with a special vote of thanks to the Honorary Treasurer, the Finance Committee and the Business Director of the SAIEE.

SAIEE Centenary Legacy

A Thermal Imaging Display was unveiled by the President on 20 November 2009 and handed over to David Kramer, manager of Sci-Bono Development Centre. The display consists of a thermal imaging camera and plasma display screen where visitors can see a display of their own body temperatures. There are also custom-built displays of a simulation of a busbar hot joint and a cryogenically cooled surface. This display will now become part of the permanent display at Sci-Bono, aimed at teaching visitors the underlying principles of science and technology. The intention is to stimulate interest among young visitors with a view to a career in engineering.

SAIEE Centenary Conference

The conference was entitled: Engineering the next 100 years - Impact of Future Electrical and Electronic Technologies, and this event took place in the auditorium of the Sci-Bono Development Centre in Newtown, Johannesburg on 20 November 2009.

The keynote speaker was Clem Sunter and the closing address was given by the SAIEE Centenary President, du Toit Grobler. The conference was attended by 76 delegates and papers on a variety of topics were presented by leaders in their fields.

National Students Project Competition

This annual SAIEE event, arranged by the KwaZulu-Natal Centre of the SAIEE, took place on 20 November 2009 at the Engineering Faculty of the University of KwaZulu-Natal in Durban. The competition, sponsored by EE Recruitment, had two categories, ie one for final year B Eng and one for final year B Tech students in electrical engineering.

Centenary Banquet

The SAIEE's Centenary Banquet was held at Wanderers Club and it was unfortunately somewhat disrupted by rain storms in large parts of the country, including Johannesburg. Despite this disruption, it remained a highlight of the 2009 Centenary Celebrations. The VIP guest list included the Minister in the Presidency, Mr Trevor Manuel MP, who proposed the Toast to the SAIEE, Presidents of sister institutions, Past Presidents of the SAIEE, and Honorary Fellows.

Awards made during the Banquet included Members who have belonged to the Institute for 50 years as well as awards to the oldest member of the SAIEE, the longest serving member of the SAIEE, the three Prestige awards of the SAIEE and Honorary Fellowship of the SAIEE to Prof Jan P Reynders, Past President.

Eskom proposed tariff increase

The SAIEE has put together the comments received from its members in a response to NERSA requests for submission in response to Eskom's application for a 35 percent price increase in terms of the MYPD2 proposal submitted to NERSA in September 2009 and amended on 30 November 2009. The President will present the SAIEE's response to the public hearings that NERSA will hold around the country.

ECSA Professional Advisory Committee

The SAIEE has been requested to nominate Professional Electrical Engineers to serve on the Professional Advisory Committee: Electrical Engineers during the 2009-2013 term of office of the Engineering Council of South Africa. SAIEE members who qualify to serve on this committee and who would like to do so should contact Stan Bridgens without delay.

Forthcoming events:

- Planting of a Memorial Tree in honour of the late Victor Wilson, Immediate Past President of the SAIEE.
- Annual Bergville Community Builders Day, 6 February 2010.
- Valentines Day Dinner Dance at the Sunnyside Park Hotel, 13 February 2010.
- Annual General Meeting of the SAIEE, 25 March 2010.

du Toit Grobler
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Allan Bennett: *13 May 1916 † 24 July 2009


Mr A F Bennett

Allan Bennett was born in Muizenberg in 1916 and educated at Rondebosch Boys High School in Cape Town. He joined the South African Post Office (SAPO) as an apprentice electrician and ascended the ladder to become Chief Engineer of the then Dept of Posts and Telecommunications (SAPT). During his career in SAPT, which later became Telkom, Allan was deeply involved in the establishment of radio transmitting and receiving stations at Olifantsfontein and Derdepoort respectively near Pretoria. He was also involved in the introduction of digital telephone switching exchanges.

Alan played a major roll in the negotiation for the establishment of the supply agreements between SAPT and various international suppliers. This resulted in local manufacture of modern transmission and switching equipment which in turn developed a strong body of development engineers and technicians in local South African companies.

Allan Bennett was an active member of the SAIEE and was elected President for the 1972/73 term of office. He later took charge of the Constitutional sub committee and was responsible for introducing all amendments to the Institute Constitution. He was awarded Honoury Fellowship of the SAIEE, which is the top honour awarded by the Institute.

To quote Jimmy Taylor, one of Allan's colleagues who contributed to this obituary, Allan Bennett was a big man in stature and spirit; calm, decisive but always approachable. He was respected by his engineering colleagues and technical ranks alike, inspiring a sense of loyalty and pride in building a modern telecommunications system. These attributes were also evident in his SAIEE activities.

Allan died of heart failure on July 24 2009 at the age of 93. He is survived by his two daughters, five grandchildren and 10 great-grandchildren.

School students win SAIEE Expo Special Awards

Each year the South African Institute of Electrical Engineers donates two prizes to the Expo Special Awards. One of the prizes is for students in Grades 8 and 9 in the Energy category and it was won by Ross Shiell (Left in the picture on the left) and Ryan Goldberg (Right in the same picture) from Kingswood College, Grahamstown. They entered a project entitled *Are Solar Panels the way to go?* and compared methods of generating clean electrical energy. The prize in the Electrical Engineering category was won by Azharudin Mohamed (Right) from Cambridge High School, East London for his project entitled *Let's play it safe*, which provided a cellphone-based locking system that can be operated from a distance. He won R1 000 for this project.

Lesedi school gets help from computer company

Business Connexion is giving 20 new computers to schools in Lesedi's historic Ratanda township. The computers will provide educational resources for the children and will support operations within the administration.

"Schools in this area do not have adequate funds to provide the equipment necessary to supplement the available learning support material needed by the pupils," says Modise Nyawane, regional executive at Business Connexion for local and provincial government.

Nyawane says Business Connexion's corporate social investment (CSI) mission is to be an innovative and inspirational corporate citizen on the African continent.

"We strive to harness the power of technology as a means of making real change and adding value to the African web of life."

Business Connexion has an extensive and carefully planned programme of CSI projects that aim to address some of the critical needs of the greater community.

"We are meticulous with regards to our strategy, which is aimed at developing sustainable projects designed to deliver practical results and contribute to ongoing improvements to communities."

He notes the fundamental objective of the company's CSI initiatives is to enhance empowerment and social upliftment.

"In this case, pupils will gain consistent benefits as the training will open the door of opportunity for them and hopefully create a pathway to better careers for the youngsters. The technology will also be used to improve the facilities available to the local community. Moreover, projects like this may address the dearth of skills in the information technology sector."

He says that private-public partnerships such as this have proved to be a successful model for dealing with many of the challenges facing South Africa. National government has also encouraged private sector companies to make a contribution to the communities where they are active.

Nyawane claims that Business Connexion has already pledged its commitment to sharing these goals.

Crouch synthesises the first ten decades

Marketing stalwart, Mike Crouch of the South African Institute of Electrical Engineers has produced an impressive history of the first 100 years of the organisation. The book was launched in October 2009 and was published by Chris van Rensburg Publications.

The publication entitled *The First Ten Decades – The History of the SAIEE 1909 – 2009*, is based on the set of the Transactions of the SAIEE, which is lodged in the Institute's Library at Innes House in Observatory, Johannesburg.

In an extensively illustrated coffee-table publication, the history of electricity and the role of the SAIEE is traced through a record of the monthly meetings held at its headquarters in Johannesburg and later at its centres in Cape Town and Durban.

It is through these monthly meetings that so many of the important issues of the day can be tracked and developments, many of them crucial to the South African economy, slowly start to emerge.

After each of the monthly meetings, a formal paper was presented to attendees and this paper was republished in the official transactions of the SAIEE for all members to read.

Crouch, in doing his research, noted that each transcription of these formal papers was particularly detailed and included any humorous comments made by the speaker along with the words such as 'hearty laughter' included in brackets.

Over the years, every one of the 1 286 papers presented – until 1983 when these presentations ceased - was recorded in detail, providing an exceptionally valuable record and a wealth of technical information on electrical engineering and its development over the years.

It is from these papers that Crouch has been able to distill much of the information published in this book but because of the sheer volume of available material, Crouch was able to include only that material which he considered to be of some interest to the readers.

Thus *The First Ten Decades* provides an excellent reference work on the history of electrical engineering in South Africa and all the editorial material is augmented by detailed company profiles from the major South African companies that have played such an important role in this field.

It is these sponsored editorial pages that provide an up-to-date review of the industries that employ most of the SAIEE's members and highlight the many achievements of these organisations over the years.

In his foreword to *The First Ten Decades*, du Toit Grobler, Centenary President of the SAIEE says that the process of writing the history of the organisation is actually still continuing because all its members are still actively contributing to the organisation, ensuring that it continues to grow from strength to strength.

"The SAIEE has a proud history of excellence and my sincere appreciation is extended to everyone who has played a role in the organisation, whether he or she is a little known ordinary member or is serving the Institute from the highest office. It is their dedication and unselfish contributions that make this Institute what it is today," he wrote.

"The slogan on the coat of arms of the SAIEE reads *Vis Nulla Sine Scientia* or *There is no Strength without Knowledge* and I trust that the knowledge of the history of the first century of the SAIEE will allow all of us to appropriately appreciate the achievements of the past and to identify and embrace the challenges of the future."

Crouch is one such person: He was elected president of the SAIEE in 1993 and, after his retirement in 1998, was appointed executive director of the organisation. In 2006, the executive director position was split and Crouch assumed the role of marketing director, working alongside Stan Bridgens, the business director.

He is married to Rosemary and they have three daughters.

Anyone interested in buying a copy of *The First Ten Decades – The History of the SAIEE 1909 – 2009* can order it from the SAIEE's head office in Johannesburg. Telephone: 011 487-9043.

du Toit Grobler would like to announce that Mike Crouch has advised him that he would like to retire as Marketing Director at the forthcoming AGM of the Institute on 25 March 2010. He said that Mike will be remembered for a long time to come and expressed appreciation to Mike for his contribution to the SAIEE over many years. He wished Mike and Rosemary a long and healthy retirement.

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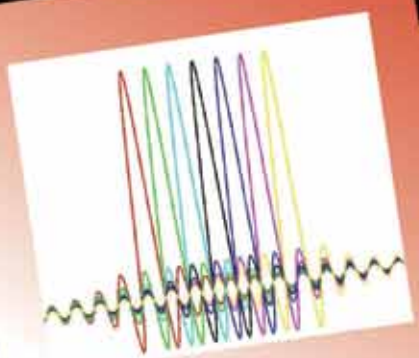

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