There's always so much to do

When you look at the simple figure of 36 525 it's hardly impressive is it? I mean it might be the average salary for a junior engineer. It might be the amount of tax paid by an experienced engineer. It could even be the cost of the last business trip to the United States, Britain or the Far East.

It's really not that big a deal. Or is it?

You see, if you consider that in 100 years there are actually 36 525 days. Days that engineers, professionals, individuals and people have spent working to enhance the South African Institute of Electrical Engineers. At some time every day, of every month, of every year, some engineers were making their contribution to keeping South Africa running.

For it is these engineers that have provided the electrical infrastructure that no-one can live without. It is these people, who have designed, developed, built and improved the computers, the electronic gadgets, the light bulbs, transmission lines, stoves, fridges and a host of other appliances that all of us rely on.

And every day this engineering infrastructure continues to expand, grow and multiply in a self-perpetuating cycle of expansion. It's a wonderful legacy created by some wonderful people who dedicated themselves to this industry and this profession.

This June the SAIEE commemorates its centenary for, a hundred years ago, a group of people gathered in a hotel in Johannesburg and thrashed out the concept of a voluntary association with the impressive-sounding moniker of 'The South African Institute of Electrical Engineers'.

Today this institute can look back on a fantastic legacy of industrious achievement that has spread throughout our land and reached even the most distant shores of South Africa's influence at Marion Island off the Antarctic coast.

So where would we be today without our engineers? It's actually a fascinating question and one that columnist David Bullard once tried to answer and got it oh so wrong. You see, every facet of society now relies on electricity. And to keep it running we need engineers. Take away the engineers and the power grid falls down, the economy falters and stutteringly grinds to a halt.

So let us not forget that it's the contribution made by all these engineers over the years that have made the SAIEE what it is today and created the position of infrastructural dominance that South Africa enjoys on the African continent.

There's an enormous sense of pride when, looking back over the years, people recount those anecdotes about So-and-So who did such-and-such or remember where they were and what they were doing when a particularly significant installation was brought to life.

These are the realities of 100 years of achievement. These achievements are driven by the individual people who made the engineering projects possible; who trained the young minds who are guiding the industry today; who created the infrastructure that made economic growth and development possible.

And all of this has been done in just 36 525 days.

Of course, the SAIEE has been home to many of the great South African minds: people like Hendrik van der Bijl, a great visionary and a great engineer, who first established the formula for the thermionic triode vacuum tube or valve.

Dr Bernard Price who established the Bernard Price Institute for Geophysical Research; Dr Basil Schonland, who was responsible for creating the Council for Scientific and Industrial Research and, of course, Trevor Wadley who developed the Tellurometer, played a catalytic role in the development of Radar, invented the ionosonde a remarkable apparatus used for measuring the height of ionised layers of air high above the Earth's surface, and perfected his Wadley Receiver, which dispensed with switching of wave bands and maintained almost perfect frequency stability using a single crystal.

Yes, South Africa has produced some great minds, some great engineers and some great businesses. But the real achievement, in my view anyway, has been the groundwork and the slog that ordinary men and women have done over the past 100 years and more.

They are the heroes of the electrical profession and the builders – and custodians – of the SAIEE.

The staff of Crown Publications and WATTnow sincerely congratulate the SAIEE and all its members for the work they've done in making the Institute what it is today.

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WATT'S

WATT'S HAPPENING



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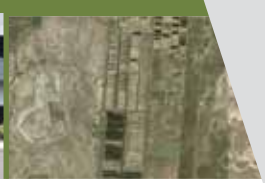
Water wastage amounts to three litres a day for every living person; Dumped fishing nets go on fishing for years; Berry's and Apples make up most of the cellphone pie; Acids from mines are threatening water supplies; Outlook for civil engineers remains positive; Intel bust for keeping AMD and other out; Nominations needed for board positions; Eskom supports Nersa regulations; Provincial officials do dodgy deals to line their pockets; Angola and Mozambique ripe for investment; Atlantis visits Hubble on a maintenance trip.



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Effective education needs everybody; Southern Cape Centre visit to Plettenberg Bay Waterworks; Technical programme from SABS available.

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Water wastage amounts to 3 litres a day for every living person

Between the United States and Canada about 20-billion litres of water are wasted every day because of leaks in the urban water system and experts point out that more water disappears each day than is needed to provide every person on the planet with up to three litres of water a day.

Canadian civil engineer, Ken Brothers, blamed management inertia and resistance to change for the consistent wastage of precious water resources. He says that the water scientists and engineers have the ability and knowledge to stop these losses but management of the different water authorities around the world are not interested in preventing losses.

This is not so in Manila, in the Philippines, where the largest water-saving project is underway and, once complete, will result in the saving of an estimated 1,5-million cubic metres of water a day. Manila is currently losing enough treated water to supply four cities the size of Vienna with their full quota of water.

According to Brothers, astonishing water savings have been achieved in countries like India. He says that in Bangalore, for instance, 185 000 people were living with a water system that delivered water to them for a few hours every day.

However, once all the leaks were repaired and the customers' consumption was metered it was possible for the water authorities to provide a consistent water supply for 24 hours a day. He blamed the leaky water infrastructure, in cities and towns around the world, for the bulk of the wastage and supply problems.

Dumped fishing nets keep killing fish, turtles, dolphins and whales

More than 640 000 tons of fishing gear gets dumped into the sea every year and abandoned nets can keep on 'ghost fishing' for years, needlessly and indiscriminately killing millions of fish according to a recent report compiled by the United Nations Environment Programme.

The report recommends that cash incentives should be introduced so fishermen will return damaged nets to the ports. It says that more accurate mapping of sub-ocean hazards should be done to prevent nets from snagging and then being cut away. It has also encouraged net manufacturers to design nets that incorporate innovative elements such as allowing them to dissolve in water after a predetermined period.

Nets are known to sometimes snap in storms, get irretrievably snagged on submerged reefs or become entangled in other fishing gear or debris on the ocean floor. The discarded nets can, according to the report, continue catching fish, turtles, sea birds and even whales for years after being dumped.

The report did not provide any figures about the estimated loss of marine life due to fishing gear that been discarded but David Osborn, co-ordinator of UNEP's Global Programme of Action on land-based sources of marine pollution, says that dumped nets are a major problem. Apart from the destruction they cause to marine species, the nets are a navigational hazard and often end up being snared in the propellers of other ships, causing immense amounts of damage.

The report says that in the United States about 150 000 crab pots are lost each year out of the 500 000 that are used. It also urges port authorities around the world to impose a system of marking nets of all boats, so that if a net is discarded, then the owners can be tracked down and penalised or fined.

In terms of innovative designs, UNEP says that nets can be made to trap only limited species of fish and let other, potentially more threatened species easily get away.

Berry's and Apples make up most of the cellphone pie

Research in Motion's BlackBerry Curve — which dominates much of the corporate smartphone market in the United States — has become the best selling phone in the country, outselling Apple's iPhone. The Storm was ranked third in the top five best selling phones, followed by the company's Pearl model at number four.

Apple's iPhone was the top-selling consumer smartphone in the third and fourth quarters of last year with the Curve second and Palm's Centro in third spot. Figures compiled by research group NPD says that BlackBerry's buy-one-get-one-free promotion, run in conjunction with Verizon, pushed the Curve's sales past those of the iPhone.

In the US, the iPhone is only available through AT&T. RIM's market share climbed 15 percent from the previous quarter to almost 50 percent of the smartphone market in the first quarter of 2009 as Apple's and Palm's share fell be about 10 percent each.

More than half of RIM's 25-million subscribers are non-corporate owners of smartphones. Apple is expected to shortly release its new iPhone model and Palm's highly anticipated Pre has just been released in the US.

Currently smartphones made up about 23 percent of handset sales in the US in the first quarter of the year.

Acids from mines are threatening water supplies

Acids from old mines represent possibly the most significant threat to South Africa's environment according to water specialists and environmentalists.

They warn that the problems experienced at Pamodzi Gold's Grootvlei Mine illustrate the severity of this threat.

Earlier this year, the Department of Minerals and Energy provided a R7,5-million subsidy to Pamodzi Gold's Grootvlei mine so that it could treat water from its operations.

The cash-strapped company has been battling to treat its mine water because of a shortage of cash and because of this was eventually forced to release untreated water into the nearby wetland to prevent flooding of the underground pumping station.

Acid mine drainage (AMD) is seen by the Department of Water Affairs and Forestry (DWAF) as the most serious threat to ground- and surface-water pollution and it warns that, in the central and western basins of the Witwatersrand mine system, the threat is both present and immediate and requires urgent intervention. According to the Department, the medium- and long-term consequences are even more worrying as acid mine drainage could result in acid draining into the water table for centuries to come.

DWAF says the acid mine drainage affects water quality in terms of salinity and the levels of sulphates and heavy metals. While acid mine drainage accounts for about five percent of the volume of water in the Vaal River, it accounts for about 20 percent of the salinity, which could include heavy metals.

Although the mining companies have ploughed large sums into improving their water treatment plants to prevent heavy minerals being discharged into the rivers, the water standards specified in its directive have still not been met and partially treated water is still being discharged into Tweelopiesspruit in the western region.

Worse still, acid mine drainage has contributed to the contamination of boreholes downstream from the region and the DWAF expects that mines will be hit with large claims for compensation from farmers and other people who have to use contaminated borehole water downstream.

It is also possible that the polluted water from mines could enter and severely damage the Sterkfontein Caves, which form part of the 3,5-million-year-old Cradle of Humankind.

DWAF's views are supported by water expert, Dr Anthony Turton, a director of TouchStone Resources, who warns that the gold-mining area of the Witwatersrand Basin – which contains large amounts of dolomite – presents the biggest threat to the natural water resources in the country.

He expects that the next major decant from mines will take place at Wemmer Pan followed by the mines surrounding the Nigel area. Turton warns that in Mpumalanga, crocodiles living along the Olifants River are dying from a combination of acid mine drainage, agricultural chemicals and sewage from urban settlements that flow into the river system.

Acid mine drainage usually occurs in defunct mines and results from the oxidisation of sulphide materials, such as pyrites, which are exposed in the mine or present in the dust underground. When mixed with water the acidity is sufficient to dissolve rocks that may contain any number of toxic metals. The acidic solution seeps into the ground-water or, as water levels rise in the defunct mine (usually over a number of years) it reaches a point where water seeps from the shafts into the surrounding river systems or underground water resources.

Outlook for civil engineers remains positive

Construction projects worth R6-billion were postponed or cancelled as a result of electricity constraints last year according to figures released by the Cement and Concrete Institute (C&CI).

It blamed high interest rates, Eskom's stringent project approval policy, weaker consumer and business confidence and low property values for the sudden slump in the construction industry.

Despite these difficulties, the C&CI says that turnover for the civil engineering sector remained healthy, primarily as a result of huge government infrastructure spending, coupled with vast capital expenditure programmes from Eskom and Transnet.

During the year, 14,7-million tons of cement products were sold, a drop of 3,9 percent when compared with sales in 2007. Sales to the nine South African provinces were down by 4,6 percent with major reductions in the Western Cape and Gauteng, mainly as a result of a slowdown in building activity in the residential sector of the market.

According to the C&CI, the civil engineering industry will probably experience single-digit growth in the coming year, particularly if the local and provincial governments are able to effectively manage and implement their budget allocations.

Intel bust for keeping AMD and others out

Regulators within the European Union have slapped a €1,06-billion fine against Intel for its anti-trust violations and found that Intel had acted in an anti-competitive manner in trying to squeeze competing company, AMD, out of the market.

According to the European Commission, Intel paid computer manufacturers to scrap or postpone plans to launch products using AMD's chips and had also paid illegal rebates to encourage manufacturers to fit Intel products. Moreover, retailers were paid to stock only those computer that use Intel's processors.

Intel argued that the findings were based on weak evidence that should be reviewed by the European Union court.

The anti-trust fine, imposed after an investigation that lasted more than eight years, is the biggest imposed on any company operating in the European Union and is considerably more that the €896-million fine imposed on glass manufacturer, Saint-Gobain, for its price fixing.

Intel has invested more than €5-billion in Europe over the years and currently employs about 6 000 people at its manufacturing plant in Ireland – the fourth largest in the group.

AMD has been protesting for years that Intel was prohibiting if from entering certain markets because of its anti-competitive behaviour and welcomed the EU's decision as it would now allow AMD to operate freely in throughout Europe.

Apart from the €1,06-billion fine — that must be paid within three months — Intel has also been instructed to cease all its illegal practices.

The fine represents just 4,15 percent of the company's turnover in 2008.

Nominations needed for board positions

The Department of Science and Technology is looking for nominations to the board of the South African National Space Agency as the final step before the new agency starts work. The board will consist of between 10 and 15 members who will be appointed for four years and be responsible for governance and control of the agency.

Nominees must be South African residents and must have relevant qualifications, skills and experience with regard to the functioning of the space agency. The Department of Science and Technology wants at least one member with a legal qualification and another with financial expertise.

The government is also looking for nominations for new board members of the South African Nuclear Energy Corporation. They have to be South African residents. The nuclear corporation will fall under the new Energy Ministry led by Dipuo Peters. President Jacob Zuma has split the Department of Minerals and Energy into two ministries.

Eskom supports Nersa regulations

Eskom says that it is confident that the rules for power purchase cost recovery proposed by the National Energy Regulator of South Africa (Nersa) will give it the basis to finalise long-awaited agreements with independent power producers (IPPs).

Eskom was designated as the sole buyer of power generated by IPPs but postponed the release of its request for proposals for its base-load IPP programme because, the state utility claimed, it needed greater certainly on the regulatory framework before it could begin negotiations.

This led to mounting levels of frustration among the IPPs as these organisations were keen to start work on new power projects. Eskom says it wanted to be certain that Nersa would allow a full pass-through of the costs associated with power purchase agreements given that these were materially higher than Eskom's own cost of generating power.

The South Africa government has pinned a lot of faith on the IPPs claiming that these organisations must, in time, provide 30 percent of the power used in South Africa.

According to Eskom's corporate counsel, Mohamed Adam, the categories of cost, outlined by Nersa, were not "exhaustive" and other costs should be considered. Eskom is unhappy with the regulator's proposal that variances of less than two percent of turnover be held in a clearing account for a three-year period of the multi-year tariff determination.

He points out that on a theoretical turnover of R50-billion this could amount to about R1-billion being held, with serious consequences for Eskom's liquidity management systems.

South Africa's consumption of electricity declined by 4,6 percent in March this year to 17 793 GWh compared with 18 698 GWh in March last year and electricity consumption for the first quarter dropped by 7,2 percent to 53 374 GWh compared with 57 527 GWh in the first quarter of 2008.

South Africa has increased its power imports by 36,1 percent to 3 165 GWh in the first quarter of this year compared with the 2325 GWh it imported in the first quarter of last year.

Provincial officials do dodgy deals to line their pockets

Companies that have direct links with high-ranking government officials managed to secure, for themselves, business worth nearly R600-million over the past four years according to a report released by the Auditor-General, Terence Nombembe.

In a report to Parliament, he says government employees at the national and provincial levels were either directors of private companies that secured state contracts or had close relatives who held a direct interest in the companies.

He notes that in the period between August 2007 and July last year a total of R36-million was paid by national government to companies that either had state employees on their payroll or had close relatives of the government officials working for them.

Nombembe says the problem is considerably more acute at a provincial level and in the auditing period from April 2005 to January 2007 business with companies that had a link to staff working in a provincial government department was worth more than R540-million.

Nearly 2 300 government employees were involved in shady deals. He found that two companies with links to the Department of Education had secured business worth R30-million in the 2005/06 financial year. The next largest amount was for more than R1-million paid to four companies with links to four officials at the Department of Correctional Services.

The departments that Nombembe found had no reported incidents included the Presidency, Home Affairs, Public Works, the Treasury, Public Enterprises, Public Service and Administration and the Public Service Commission.

Government departments that employed staff who were either directors of private companies or who had close relatives that worked for these companies included the Police, Statistics SA, Labour, Agriculture, Housing, Water and Forestry.

In terms of the Public Service Act, any state employee who receives remuneration or rewards for work done on behalf of the state should pay that money into a revenue account.

Angola and Mozambique ripe for investment

Reforms in the electricity regulations in Angola and Mozambique mean that these two countries are ripe for significant investments in new power generation schemes according the consultancy firm Frost & Sullivan.

A report compiled by this consulting group says that both countries have changed their investment laws, allowing foreign and domestic investors equal access to investment incentives. This opens the way for private investors to embark on public infrastructure projects. The regional economic growth is expected to remain relatively constant at about six percent a year for the next ten years. It is now the environmental factors that may start influencing a change in electricity generation projects in both these countries, says Cornelis van der Waal, energy manager at Frost & Sullivan.

He says that both Mozambique and Angola have been "reshaping" their electricity industries to meet the escalating demand which is expected to reach 11 percent a year between now and 2015. He says this is largely due to the agricultural boom, growth in the manufacturing sector and an increasing focus on electrification projects in urban and rural areas.

The Angolan electricity industry is set for similar growth, of 12 percent a year until 2015, and the national reconstruction programme in that country is expected to play a significant role in boosting electricity demand and the consequent investment in more power generating capacity, De Waal says.

He concedes that the investment environment is characterised by long, drawn-out, bureaucratic procedures in most of the government institutions along with a high level of corruption among government officials. This makes foreign investors reluctant to invest in either of these countries.

Atlantis visits Hubble on a maintenance trip

The space shuttle Atlantis made a week-long visit to the Hubble space telescope and repaired various vital systems to extend the life of the telescope for another ten years or so. Hubble is in orbit about 500 kilometres above the Earth's surface and is orbiting at almost 28 000 kilometres an hour.

The mission, known as STS-125, will replace the cameras, gyroscopes, batteries and computer systems in the space telescope. After years of exposure to the extreme temperatures of space, the insulation on the Hubble was also replaced.

The maintenance and repair programme means that the Hubble will be able to look deeper into space than ever before

Astronaut, Megan Arthur, was responsible for gingerly plugging a robotic arm into the space telescope before lifting it safely into a specially designed cradle at the back of the shuttle's cargo bay.

The upgrades to the Hubble space telescope – which has cost about $10-billion so far – will increase its lifespan to at least 2014 and by then it will be replaced by an infrared-sensitive James Webb Space Telescope.

With the upgrades successfully completed NASA will be able to use Hubble's new wide-field camera to look deep into the light streaming from objects when the universe was about 500-million years old. The targets are so far away that the light shifted from visible ultraviolet wavelengths of infrared.

The Atlantis flight to Hubble is the last flight it will ever do. The space shuttle fleet is due to be retired within the next 17 months after eight more missions.

However, NASA was concerned about damage caused to Atlantis during its liftoff and asked the astronauts to examine the heat shield. Using a boom with sensors, the astronauts examined the thermal protection system on the nose, wings and underside of shuttle and found a 533-millimetre scratch on the starboard side, caused by debris that hit the space craft 104 seconds after the launch.

As a precaution, NASA decided to put a four-person astronaut rescue crew on standby and set the rescue craft, Endeavour, on a T-Minus-Seven-Day launch schedule. If Atlantis was unsafe for the trip back to Earth, Endeavour would be launched and once in orbit, would manoeuvre close to Atlantis and grasp it with a robot arm.

Once firmly gripped, the entire crew of Atlantis planned to spacewalk to Endeavour, over the course of a few days, and once safely on board, it would return to Earth with 11 crew members on board. NASA would then ditch the deserted Atlantis shuttle into the Pacific Ocean if it survived re-entry into the Earth's atmosphere.

Perched on the end of the Canadian-built remote manipulator system, astronaut Andrew Feustel, mission specialist, performs work on the Hubble Space Telescope as the first of five STS-125 spacewalks kicks off a week's work on the orbiting observatory. Photo credit: NASA

Taxi drivers cry foul but Rea Vaya is going ahead

While angry taxi bosses rant and rave about the Bus Rapid Transport (BRT) systems being introduced in eight metropolitan regions around the country, commuters and road users – particularly in Tshwane and the Greater Johannesburg Metropolitan Area – will probably welcome the systems once they are running properly.

In Johannesburg the BRT will transport hundreds of thousands of people a day along dedicated bus lanes (in the centre of existing roads) with bus stations every five hundred metres, charging commuters fares of between R3,00 and R8,00 for a trip and running from 05h00 until midnight every day.

During peak times the BRT buses will run every three minutes and in off-peak times every 10 minutes.

How is this system going to work?

Johannesburg has been faced with escalating transport problems as the number of cars on the road continue to increase by about seven percent a year, clogging the major highways and the arterial road networks to a point of gridlock during peak times.

The city, in conjunction with other councils, has already embarked on a multi-billion rand upgrading project for the freeway system but that alone is not sufficient to relieve congestion.

As former Transport Minister Jeff Radebe has forcibly and consistently pointed out, government has a responsibility to transform the public transport experience for the travelling public, to expand affordable access to mobility for all people and ensure that South Africa's cities are sustainable and not unliveable and uncompetitive because of traffic congestion.

In April, just two days before the general election and about two weeks before he was removed as the Minister of Transport and appointed to head the Department of Justice and Constitutional Development, Jeff Radebe told the delegates at the National Summit on Taxi Industry Participation in the Bus Rapid Transit System that: "Government is firm that we need to change [public transportation] in order to be sustainable. No-change is not an option."

The Witwatersrand and Tshwane highways are a traffic nightmare for commuters and the inefficient and inadequate bus services are unable to cope with the volume of commuters that need to travel at peak time. Both cities have plans to introduce BRT systems – along with other major metropolitan areas around the country – to comply with the government's Public Transportation Strategy.

In Johannesburg, the BRT system is branded as Rea Vaya (which means we are going) and is promising to provide a safe, efficient, high quality and affordable public transport service for everyone in the city. It will integrate with other public transport initiatives such as Metrorail and the Gautrain.

New Rea Vaya articulated buses, known as trunk buses and carrying up to 112 passengers at a time, for the main artery of the BRT system. These trunk buses will operate along the main trunk routes using new roads built in the designated median lanes and stopping at purpose-built bus stations to pick up or off load passengers. The bus stations are just 500 metres apart. The trunk buses will stop only at the stations and will have doors on the right-hand side that open onto the elevated bus station platforms.

From the bus stations, a fleet of complementary buses, capable of picking up passengers at the Rea Vaya stations or at the kerbside - and with a capacity of up to 75 passengers - will carry passengers to the main drop-off points in much the same way as the municipal bus service does.

The complementary buses will accommodate high-level boarding through doors on the right-hand side to collect passengers at the bus stations with conventional doors on the left-hand side of the bus to collect or drop-off passengers at bus stops on the pavement.

Feeder buses with a capacity of up to 32 people will be used to ferry passengers to the outlying areas not directly serviced by the Rea Vaya network. The Rea Vaya system will eventually stretch from Sunninghill in the northern suburbs to Lenasia in the south and from Protea Glen in the west to Eastgate in the east.

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The terminals are situated at the end of each route where the buses will turn around and change drivers before departing back along the route again. When the entire system is operational (about 2013) there will be terminals at Lenasia, Protea Glen, Dobsonville, Baragwanath, Eastgate, Alexandra, Wynberg, Randburg and Sunninghill.

The Phase 1A section of the Rea Vaya network is due to be fully operational by the time the Confederation's Cup starts in June. The trunk route will run from Regina Mundi to Ellis Park with complementary routes from Dobsonville to Ellis Park; from Dobsonville to Maponya Mall as well as the CBD loop from north to south and from east to west.

Taxi drivers, however, have threatened to prevent the buses from running during the Confederation's Cup. In fact, Mvuyisile Mente, spokesperson for the National Taxi Alliance has threatened to make next year's soccer World Cup event "ungovernable" and "cause large scale chaos" if the system is not scrapped.

The fares for the Rea Vaya buses have already been published for public comment and comprise:

Trunk route:	R5,00
Complementary route outside the CBD:	R5,00
Complementary CBD circular route:	R3,00
Feeder route:	R3,00
Combination of service:	R8,00

When completed the Rea Vaya network will provide 300 kilometres of trunk routes across the city. Phase 1B will be completed in time for the World Cup 2010 and the full phase will be operational by 2013 when the following routes will be available:

- The Yellow Route from Lenasia to Sunninghill
- The Grey Route from Jabulani to Alexander
- The Red Route from Baragwaneth to Ellis Park
- The Maroon Route from Orlando to Sandton
- The Green Route from Johannesburg CBD to Randburg
- The Blue Route from Dobsonville to Eastgate
- The Orange Route from Sandton to Alexandra.

Currently, taxis are main form of transport for commuters and carry four million people to and from work each day. This gives the taxi industry a dominant 65 percent share of all public transport in South Africa.

In Johannesburg alone, 12 500 taxis carry over a million people a day, which equates to a market share of 72 percent of the public transport users in the city, according to figures published in the South African Institute of Race Relations' 2007/08 South Africa Survey.

Perhaps this is the reason that the taxi industry feels so threatened by Rea Vaya and the other systems being implemented throughout the country. The BRT in Johannesburg is aiming to carry about 430 000 people a day and, if taxis are carrying a million people a day right now then, obviously, once the BRT is fully operational they stand to lose thousands of customers.

However, Radebe has pointed out repeatedly that there will be, in his words, "no loss of legitimate jobs or profits for taxi operators who move into the BRT system."

That's a welcome guarantee for taxi drivers and operators but what does it actually mean? Radebe said that the government expects that the first phase of the BRT in Johannesburg will be completed by the end of 2012 and that 8 000 taxis will be affected. Between then and 2020, a further 15 000 to 18 000 taxis will be affected.

However, Radebe claimed that this amounts to just 15 percent of the entire taxi fleet in South Africa and added that the BRT will have no effect on the vast majority of taxi services in South Africa. He might be right but for the 26 000 taxi drivers that are out of work that statement will not be quite so reassuring.

According to Radebe, the Public Transport Strategy from government calls for a major re-organisation and optimisation of current public transport services. He said the re-organisation – which will lead to integrated public transport networks – is meant to create opportunities and empowerment for existing taxi operators rather than displace them, run them out of business or reduce the employment opportunities in the industry.

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At the 2008 Transport Indaba, Radebe met with government ministers, provincial and municipal transport representatives and members of the local government association. Between them, they resolved that the minibus industry should form the "nucleus" of the BRT systems. And, that the taxi industry should be included in such a way that its current share of the commuter market is not reduced on affected routes.

Radebe said that the Phase 1A of the BRT network would directly affect the taxi industry. "I would like to highlight that being a BRT operator means that you own your own BRT vehicle fleet and have direct control over the vehicle procurement, maintenance, staff hiring and training, day-to-day running of the depots and so forth."

Of course that implies that all BRT vehicles will have to be properly maintained, kept in a roadworthy condition and be driven by properly licensed drivers. Radebe also referred to the concern, among taxi operators, that an operating licence lapses every seven years. He said that the only reason a licence would not be renewed would be if the applicant was no longer fit to drive or if the vehicle was not registered, licensed or roadworthy.

These regulations are aimed at ensuring that taxis operating on South Africa's roads, as well as those taking part in the BRT systems in metropolitan areas, are all roadworthy and are driven by properly competent drivers. Given the taxi drivers' track record for law-breaking it's hardly surprising that they are objecting so vehemently to the BRT systems in Johannesburg and Cape Town.

The main features of the BRT systems are:

- Dedicated bus lanes that are operated separately from all other traffic modes, allowing buses to operate at high levels of reliability and efficiency as only properly trained, professional drivers are allowed to use these lanes;
- Lower construction costs of the bus lanes, which are located in the median or the roadway rather than on the kerbside;
- Integrated networks, routes and corridors that coincide with each other;
- Pre-boarding fare collection and verification;
- Level boarding at bus stations so that people with disabilities can use public transport;
- Fare and physical integration of routes, corridors and feeder services;
- Entry to the BRT system restricted to operators who meet the prescribed standards;
- System management through a centralised control centre.

In the Rea Vaya network each bus operator will have a concession to use the system.

The BRT systems in various different regions are seen, by local and provincial government officials, as economic development projects with short, medium and long-term benefits. In Johannesburg, the Rea Vaya project will form the backbone of plans to rejuvenate the city which, in time, will be dominated by wide boulevards lined with landscaped pavements, multi-storey affordable flats, offices, shops and entertainment venues dominated by a really efficient and easy-to-use public transport system.

Where do the taxis fit into that vision?

Arrive Alive is one of the many organisations that is solidly behind the BRT and it says that the short-term benefit is that there is a frequent and reliable public transport system that is affordable, safe and efficient. At the same time the BRT will reduce traffic congestion, energy consumption and vehicle emissions and allow for the recapitalisation of the public transport fleet.

In terms of environmental considerations, Arrive Alive says that an environmental impact study has shown that there will be an expected saving of 382 940 tons of carbon dioxide equivalent emissions by 2010, increasing to savings of 1,6-milion tons of carbon dioxide by 2020.

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It says that by taking thousands of poor quality buses, running on poor quality fuel, off the streets and replacing them with hundreds of new buses that have the latest pollution reducing equipment and run on cleaner fuel, will benefit all the residents of this city.

For the Rea Vaya to be successful, Johannesburg's commuters will have to support the system and to get that support it's imperative that the entire network is perceived as being safe and secure. To reinforce the sense of public safety Rea Vaya is installing video monitoring systems on all buses and at the stations and terminals.

The city also plans to increase the size of the metropolitan police department so that more officers can be deployed at stations or on the buses themselves.

Strong government commitment to BRT systems throughout the country, coupled with investments being made in constructing the networks, it's clear that the taxi industry will certainly feel threatened by the new public transport system.

But what do the taxi drivers, taxi owners or taxi associations want from the government? Two major bodies, the South African National Taxi council (Santaco) and the National Taxi Alliance wans to secure a larger stake in the control of an Integrated Rapid Transit System so that taxi owners can have greater ownership of the practical aspects of the systems.

Unlike Johannesburg, Cape Town's council says that it will purchase the vehicles for its BRT system for the industry as a whole and will provide these vehicles to taxi and bus operators to run. Mvuyisile Mente, spokesperson for the National Taxi Alliance says that they want more consultation with government and have called on the Transport Department to halt all infrastructural work on all BRT systems underway throughout the country.

South Africa's new President, Jacob Zuma, who made sweeping changes to his cabinet and to the government departments, has appointed Sibusiso Ndebele as the new Minister of Transport. He will now have to negotiate with an increasingly militant group of taxi operators and owners who are determined to halt all BRT systems in the country.

There have already been a number of protests, strikes, disruptions, violence and even virtual war between police and lawless, uncontrollable taxi drivers who have protested in Cape Town and Johannesburg.

In fact, Braam de Jong, senior operations executive at Putco warns that the taxi operators are likely to hold the country to ransom in order to stop the BRT system. He says that taxi operators have warned that if the BRT goes ahead they will cause chaos at the World Cup next year.

Members of the taxi industry held a mass meeting at the Jabulani Amphitheatre in Soweto last month and warned that if Jacob Zuma did not address their concerns and include them in the BRT system then "all hell will break loose".

Zweli Makhuba, an executive member of the United Taxi Association Forum says that the government is still doing a lot of things that leave the taxi operators on the sidelines and this process has to stop because the taxi operators are not happy.

In fact, Phil Nzima, the chairman of the United Taxi Association Forum, says that he was told at a meeting with Gauteng's Transport MEC, Ignatius Jacobs, that only those taxis purchased after 2006 would be eligible for permits to transport thousands of passengers who are expected to attend the World Cup fixtures in Johannesburg next year.

He says he was furious because what is the taxi industry expected to do with the older taxis? "When we go to other countries, we use their transport systems. Why can't foreigners, who come here use ours," he asks.

Perhaps it's a valid question, but given the track-record of road abuse and the state of many taxis, driver lawlessness and unnecessary road deaths, the taxi industry does not inspire confidence when it comes to entrusting your life to this form of public transport.

The first Rea Vaya station was launched in Joubert Park on Tuesday, giving Joburg commuters a taste of world class public transport. Image: Werner Beukes SAPA

Watt Says

Hi Paddy,

The article *Coal and Electricity* in WattNow of April provides a valuable insight into the history of electricity supply on the Witwatersrand.

I think there is one minor geographical error:

The coal mining area in the vicinity of Viljoensdrif and the Taaibosch Spruit is virtually at the geometric centre of the area known today as the *Vaal Triangle* (Vereeniging, Vanderbijlpark and Sasolburg). The town of Parys is actually about 45 km further to the west, downstream along the Vaal River. This coal deposit also provides the raw material for the Sasol I plant and feeds the nearby Taaibos power station, in addition to the former Vaal power station. The town of Vereeniging was built up in the 1890's as departure point for hundreds of wagons, loaded with coal, needed on the Witwatersrand gold mines. Wagons were used to ferry the coal from the mines before a railway to the Vaal River was built and before the Boksburg-Brakpan-Springs coal mines were opened.

Regards
Tony Fisher (Retired SAIEE member)

Dear Sir

I am looking to work in South Africa and would be eager to come to your country. I am a fully qualified Electrical Engineer, registered with the Engineering Council in London as an Incorporated Engineer and I am a Fellow of the Institute of Engineering Technology in London.

My experience is extensive and broad, extending to mechanical and civil engineering, with work on Generation and Transmission and Distribution to 11kV both in maintenance and construction, marine and land based.

Engineering Management of Projects, the control of an Engineering Department, for a large food manufacturer, including preparation of budgets and control, of both capital and revenue, has been part of my experience.

Planned Maintenance systems using PPM combined with Condition Based Monitoring is a subject that I specialise in having the advantage of low production downtime and low repair costs both in terms of labour and materials.

Perhaps there is an opportunity in your country.

Yours faithfully,
James S Galloway, I.Eng., FIET.
jsgalloway_1@msn.com

Dear Paddy.

Reading Mr. Holmes article in the April issue of Wattnow prompted me to write this response. I am a lecturer at one of the largest universities in the country, and I act as external examiner and moderator for two more. My university has tried and recently discarded OBE in all but name, so I feel qualified to respond to Mr. Holmes.

Sir, I am sorry to say that I think you and your peers have been robbed without recourse to the law. You are behind most European and Asian countries and Australia and, despite what is often said, the USA and Canada too.

Our first year students are seriously lacking many basic skills and a lot of "common knowledge". This leaves our first year lecturers scrambling to teach the basics. When the students reach second year, they do so having not completed the first year syllabus.

This leaves the second year lecturers scrambling to teach enough of the first year syllabus in order that the students can cope with the second year. Repeat the process for third and fourth years. Our new students, products of the OBE system, are even worse off.

For example, during this semester, out of a class of 28 students, only one student could solve a compound interest problem (and he comes from Nigeria). A few did not know what compound interest is. On the other hand, their sense of entitlement is exceptionally strong.

What do we do? Fail the students wholesale? Force them to repeat? Firstly, most of the students that fail in their first year cannot afford a second try. Secondly, lecturers in my university have to justify high failure rates and write umpteen reports and "improvement plans".

Raises and promotions are linked to student performance in some universities. In other words, we are punished for student failure, while students are punished for South Africa's failure to educate them properly. Thirdly, universities are compensated by the government in relation to the number of students that achieve an exit level qualification.

The result is that standards are dropped. Lecturers slip in easy question in exams, to increase the pass rate. Principles?

Many lecturers love their work and would prefer not to lose it. They know full well that sub-standard students are bad for the country, and sometimes even dangerous. Faced with aggressive students and upper management trying to run the university as a business, and thus take the attitude that the customer (student) is always right, lecturers are left floating alone in hostile, shark-infested waters.

When lecturers do leave, they are replaced with young men and women with no experience and education that is not up to scratch. Then their students are even worse off.

One final item to think about.

I matriculated in the 80s, and we were taught Sin, Cos and Tan too, along with their reciprocals, in Standard Eight I think. On standard grade.

Please publish my comments anonymously.

[The author's name is known to the Editor]

...On a wintery June evening in 1909

The Grand National Hotel in Johannesburg must have been buzzing on a chilly, dark, Highveld winter evening in June 1909 when 117 curious engineers got together, at the invitation of Messrs JR Bradley, HB Murgatroyd and P E Gregson, to attend a 'general meeting' of the South African Institute of Electrical Engineers.

Bradley, Murgatroyd and Gregson had discussed, among themselves, the possibility of forming a new voluntary association of electrical engineers and initially wanted to approach the London Institute of Electrical Engineers for their sanction to start a local branch in South Africa.

Why they decided that a new institution would be preferable remains a mystery, unlike the more sensible notion of establishing a national body rather than a regional association only. Most of the electrical engineers at the time were based on the Witwatersrand so a regional body, predominantly to serve the huge mining interests on the Rand, may have made sense but once Bradley, Murgatroyd and Gregson had canvassed other engineers, they realised that almost everyone was in favour of a national body.

So, on that wintery, cold night, 117 founding members of the South African Institute of Electrical Engineers filled in the relevant application forms and the new SAIEE was born. Although the organisation had only been operational for a few months, it still felt that it was important to hold an Annual General Meeting in 1909 and so it was that in November, the founder members and one or two new members were invited to adopt the first constitution of the SAIEE and to elect the first council members.

Who were these engineers that had descended on Johannesburg? They included some really famous names such a Hubert Davies, Reunert, Lenz, Robeson, Sivewright and many more. The electrification of the mines was one of the most important prospects for all electrical engineers and they realised, then, that a professional and recognised body of trained people was needed to represent the new profession.

In May 1897, an earlier association, known then as the *Society of Electrical Engineers* was formed and an interim constitution even thrashed out. By August of that year, 50 founding members were mustered and they shared the view that the Society should hold regular meetings "for studying electrical science and its commercial application". It also promised to promote discussion among those members engaged in electrical pursuits and to promote the material interests of its members.

Sir James Sivewright, a telegraph engineer, took on the mantle as the first President of the Society. He was well-versed in some aspects of electrical engineering by then and he had published, the previous year, a widely-used textbook entitled *Telegraphy*, in which he collaborated with Sir William Preece, the chief engineer of the British Post Office.

Sivewright went on to become a member of Cape House of Assembly – having successfully embarked on a number of business ventures – mainly as a result of his close friendship with Cecil Rhodes and consequently was unable to attend meetings held by the Society of Electrical Engineers in Johannesburg and, anyway, was far too busily involved in politics.

However, various other members of the Society played a pivotal role in this society, eventually getting the Chamber of Mines to formally recognise it and even place its Council Chamber at the society's disposal for any meetings they wished to hold.

The society was certainly instrumental in changing the way that business viewed the future of electricity. However, the South African War changed all that and between 1899 and 1903 the society effectively collapsed as no meetings of the society were held until the formation of the SAIEE in 1909.

Early membership of the SAIEE was limited to applicants who were at least 30-years-old and had completed a formal apprenticeship or an approved pupilage in electrical engineering. Graduation from an approved engineering college was regarded as being equivalent to an apprenticeship.

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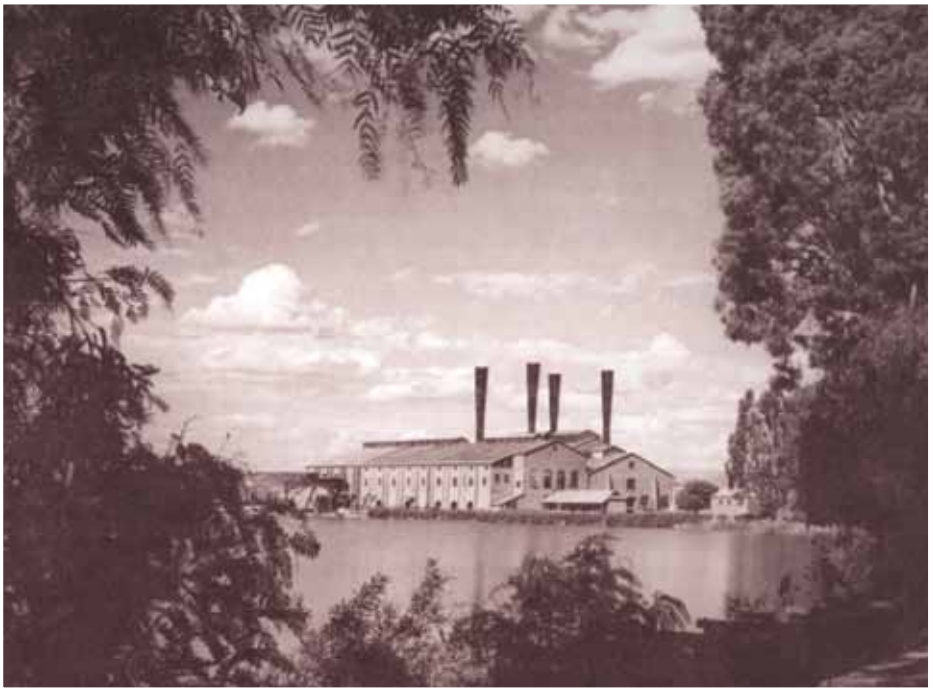
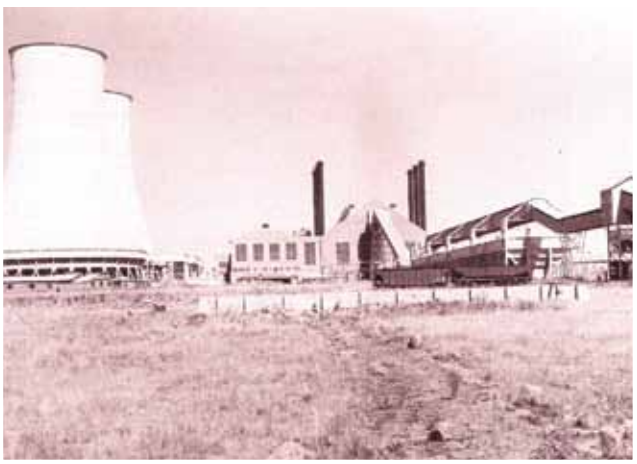


Left: De Beers Central Power Station at Kimberley - March 1951.



Bottom left: A general view of the Vaal Power Station in 1944.

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Many of the electrical engineers had come to South Africa from Britain where they had been trained and, as one engineer remarked in the early 1900s, the Rand "is undoubtedly the greatest electrical centre in the World, with, I believe, Newcastle (in England) a fair second...".

At that time, being an electrical engineer in South Africa was not without its hazards and the first 11 obituaries recorded by the SAIEE showed that only one person had lived to beyond 70 years of age. Most of the other deaths were among men (only men were electrical engineers in those days) in their 60s and even one of South Africa's own electrical pioneers, Hubert Davies died prematurely in 1918 at the age of 60. By then he'd made a fortune but, more importantly, had left a really valuable legacy by spreading electricity to all but the remotest parts of southern Africa.

Much of the SAIEE's early activities – and, I suppose, those of its members, too – were devoted to power engineering but by 1921, following significant advances in radio-telegraphy, a specialist section of the Institute was formed to monitor and advise on developments in this specialised field.

This approach has remained a hallmark of the SAIEE over the years with specialist groups being formed to keep pace with the many rapid changes and advancements that have confronted the members of the SAIEE.

Du Toit Grobler, the SAIEE's President in its centenary year, reaffirmed the objectives of the Institute today during a road show and tour of all the SAIEE centres in South Africa. He says that while the constitution of the SAIEE has been changed and amended over the years its objectives today remain very much the same as those that were adopted at the first Annual General Meeting in November 1909.

Today these objectives are:

- To advance electrical engineering and associated sciences and their applications.
- To promote and uphold the professional standing of members of the Institute and provide career guidance for younger members.
- To promote publications and other works pertaining to electrical engineering and associated sciences and to recognize the merits of such publications and works.
- To promote the investigation of electrical and associated matters.
- To lead, direct and influence policy in electrical engineering and associated matters in the public, private and educational sectors.
- To promote and advance education and training in electrical engineering and associated sciences in southern Africa.
- To identify and promote the use of creative methods of applying electrical engineering and associated sciences in the interest of the southern African community.

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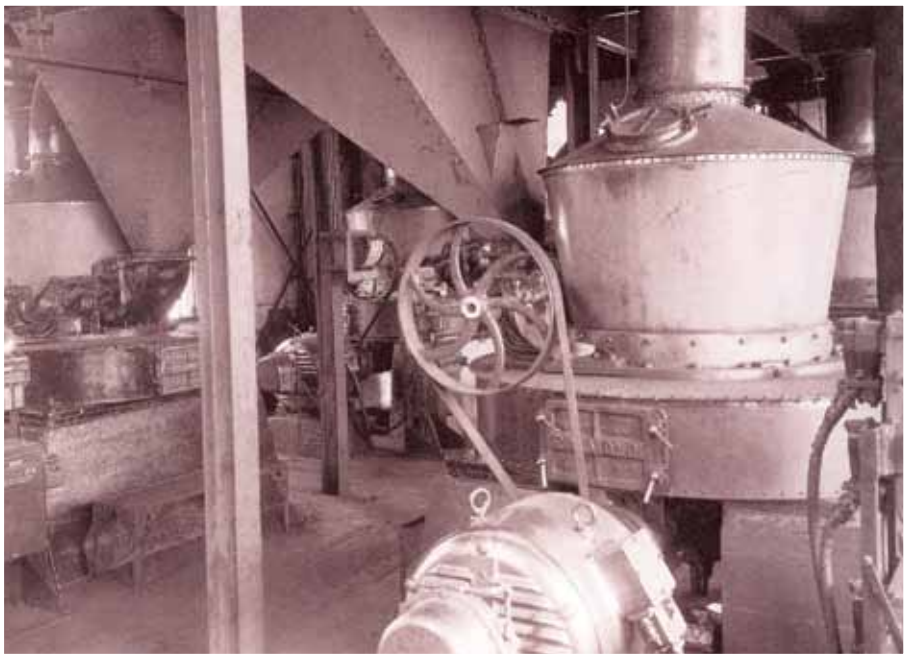

Congella Power Station's coal-pulverising mills – minute in comparison with the gigantic mills of modernday power stations.

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- To promote and develop the entrepreneurial attitudes and skills and the engineering management and communication skills of its members.
- To promote membership and involve members at an early age in the activities, leadership and formulation of policies of the Institute.
- Through effective financial management, ensure that maximum short, medium and long-term advantages accrue to the members in the form of stability, facilities, benefits and activities.
- To re-define the fields of electrical science and its applications in the interests of the Institute in accordance with world-wide technical progress and, to propagate the updated definitions as and when needed.
- To increase appreciation of the role of electrical engineers, electrical engineering and associated sciences through interaction between the Institute and the southern African community.
- To continue to streamline and develop the efficiency of the committee and secretarial structures and operations of the Institute to ensure fast and effective responsiveness for members.

The objectives today are as valid and precise as those objectives set down in the first meetings of the SAIEE in 1909 when electrical engineering was in its infancy here and when computers were not even a dream in anyone's mind.

Of course, there has, over the years been a constant stream of information emanating from the SAIEE and unsurprisingly, a publication entitled *The Transactions of the South African Institute of Electrical Engineers* was already being published in 1910 to keep the membership informed. In different guises, and with different titles over the years, the SAIEE has continued to provide a publication for its members and today, *WATTnow* fulfils that role.

Perhaps one of the more significant achievements of the SAIEE over the years is reflected in its membership profile, climbing from 117 members in 1909 to 5 000 people today. There are different grades of membership now, for Honorary Fellows, Fellows, Senior Members, Members, Companies, Associates and even Students.

As Grobler points out the age profile of members shows, quite clearly, that the Institute is attracting younger members into its fold and, as a result, has now set a provision that at least six members of the council should be aged 35 or less.

Given South Africa's troubled legacy of apartheid – when, for years, black and coloured people were not able to do an electrical apprenticeship or enrol for electrical engineering at any university other than Fort Hare – it was imperative for the SAIEE to examine and realign its demographics in a post-1994 democratic South Africa.

It did this by deliberately and immediately opening its doors to people of all races prior to the 1994 elections and proved, successfully, that people from all walks of life were welcome within the institute provided they met the admissions criteria.

So it was hardly surprising that the first female president of the SAIEE was elected to office in the 1995/1996 year and the first black president served between 2004 and 2005.

Today the SAIEE continues to show encouraging growth in membership from female, black, Indian and coloured people and the SAIEE is now working hard to ensure that the council itself and the various centre committees start reflecting the demographics of a democratic South Africa more precisely.

These centre committees have taken a long time to grow and thrive. Essentially they are the regional branches of the SAIEE and it took almost 50 years for the first centre, in the Western Cape, to be established. It was formed in 1953 and, since then, has maintained an active presence both at a national and a regional level.

Since the Western Cape branch opened, many other centres have sprouted up: Durban in kwaZulu-Natal; Southern Cape based in George; Mpumalanga in Secunda; Vaal Triangle at Sasolburg; Eastern Cape at Port Elizabeth; Free State in Bloemfontein and so on.

Of course, one of the core objectives of the SAIEE has been to foster education in electrical engineering and it has done so extremely successfully, providing bursaries for tertiary education of engineers, engineering technologists and electrical technicians.

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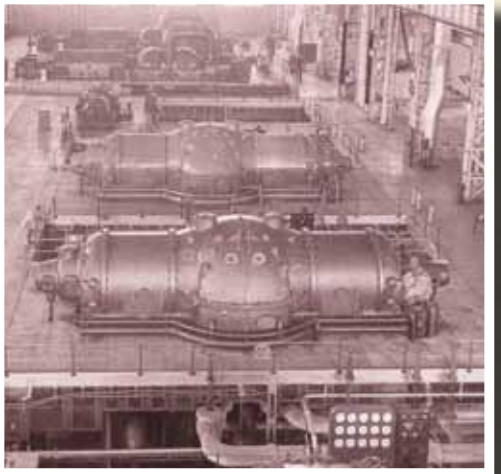

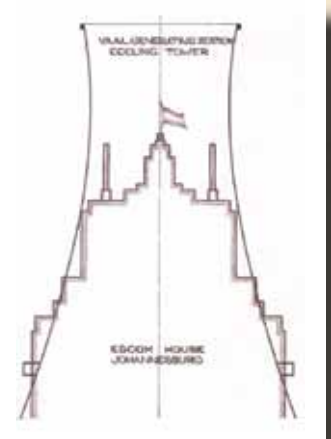

Far left: Vaal Power Station turbines – a 1947 view of three Lungstrom radial-flow sets in the foreground, and two axial-flow sets in the background, each with a 33 MW capacity.

Left: This scaled line sketch demonstrates the size of the Vaal Power Station's cooling towers compared to the 72 m high Escom House in johannesburg.

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It has now embarked on a more serious challenge: to provide additional training to students in secondary schools and, more importantly, to train the teachers who have to educate young minds in the wonders of science and mathematics.

Some of the more significant contributions include the role that the SAIEE has played in mentoring the Bergville Community in northern KwaZulu-Natal, along with the teacher in-service training programme being run in conjunction with the South African Institute of Electrical and Electronic Engineers. It is known as Train the Trainer and helps to improve the competence of teachers teaching subject crucial for engineering at a secondary school level.

Grobler points out that the SAIEE has been invited, by the Department of Science and Technology, to play an active role in the Dinaledi Schools Programme, which sets out to increase access to and understanding of mathematics and science at a higher-grade level among schools from disadvantaged communities that do not have the resources to do so themselves.

This project has played an import role in contributing to the steady increase in the pass rate for students studying mathematics and science. The department is hoping that, with the help of voluntary associations and volunteer trainers, it will be able to have at least 500 schools throughout the country taking part in the Dinaledi programme by the end of the year.

Institutions and businesses have been invited to adopt at least one of these schools and support it in improving the competence of teachers working there and providing it with some material or financial support in the form of teaching kits, scientific equipment, improved science laboratories and so forth. Grobler believes that this initiative provides an ideal opportunity for the regional centres to get involved and adopt a school themselves.

Since 1909 a number of awards have been introduced and today, these awards carry with them a great deal of prestige because, in most cases, they are made based on the judgement of peers within the electrical engineering profession.

The awards include:

- The President's Award – This is the Institute's premier award and it recognises current major contributions, in any sector of electrical, electronic, telecommunications and computer engineering. The award has a cash premium and is open to members and non-members of SAIEE.
- The SAIEE Engineer of the Year Award – This award is made to a member of the SAIEE who has energetically and voluntarily worked towards promoting electrical engineering and its applications, for the benefit of the southern African community, or through his or her involvement in Institute affairs. The award, together with a cash premium, is sponsored by Alstom SA.
- Keith Plowden Young Achiever's Award – This award, together with a cash premium, is sponsored by Powertech Transformers and is named in memory of Keith Plowden, a past President of the Institute who played a significant role in the electrical power industry. It is awarded to the most outstanding young achiever of the year in the field of electrical or electronic engineering and is open to members and non-members of the SAIEE. This award is made to people aged 35 or less.
- Award for papers of merit published in the SAIEE Africa Research Journal
- Awards for the best Electrical Engineering Student Projects
- Prizes for best students in Electrical Engineering

It is indeed an illustrious and impressive history that has been created by waves of committed professionals over the past 100 years and as Grobler points out there is just as great a level of commitment today as there has been in the past.

"The slogan on the coat of arms of the SAIEE reads: *Vis nulla sine scientia* or, in other words *There is no strength without knowledge*. "The knowledge of our history must be used, and must allow us to appreciate, the achievements of the past and identify the challenges of the future," says Grobler.

It's highly likely that the office bearers, elected at the first meeting of the institute in November 1909 would whole-heartedly agree. And, they'd probably smile to themselves, confident that the foundations they laid have created a memorable, vibrant monument, rather than a sterile, ineffectual and cumbersomely bureaucratic edifice.

The SAIEE is as alive today as it was 100 years ago – and long may it remain that way.

That green sludge called algae may solve fuel issues

There are literally thousands of companies around the world delving into the production of biofuels and making magnificent predictions of how, sometime soon, biofuels made from non-agricultural plants will replace the fossil fuels that the world depends upon.

Some of the claims may well be outrageous rantings of a smooth-talking 'entrepreneur' eager to fleece investors of all their money - and their dignity too.

But there are many others that appear to be deadly serious about providing biofuels for the world. Once such company that is making serious promises and predictions about biofuels is Sapphire Energy, based in California. It says it will produce 5-billion litres of biofuel by 2025.

The fuel is being manufactured from algae and the company is setting up production facilities in New Mexico and working with various airlines so that it can produce diesel, petrol and aviation fuel for the world markets.

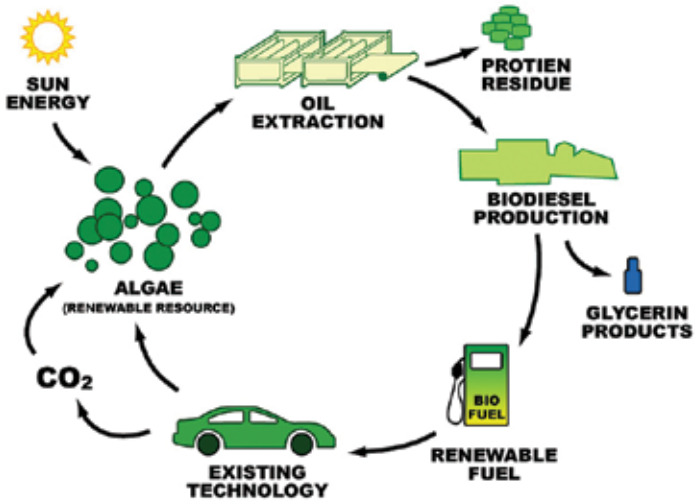
According to Dr Brian Goodall, vice president of the company, two airlines have made test flights using Sapphire's algal fuel. The first involved a Boeing 737-800 belonging to Continental Airlines. It flew for two hours using a blend of 50 percent biofuel in one engine. The flight included a full power takeoff, a climb to 37 000 feet (11 277 metres), a descent, approach and landing.

The second test was undertaken by Japan Airlines' 747 and it was run on biofuel made from a combination of camelina (considered a weed in North America but actually an oilseed), jatropha and algae.

Boeing has joined scientists and academics in its belief that biofuels made from algae can be used to replace aviation fuel and it has founded the *Algal Biomass Organisation* to commercialise and market algal biofuels. Boeing's Billy Glover says that the company recognises that algae biomass holds tremendous potential for use as a jet fuel. Other airlines, including Virgin and KLM Royal Dutch have tested algal fuels and JetBlue and Airbus have joined in, experimenting with algal jet fuels as well.

Sapphire says that its fuel is a "drop-in" alternative that is chemically identical to crude oil and, because of this, is compatible with anything on the road or in the air right now. Other companies working on the development of biofuels from algae include PetroSun Biofuels, Blue Marble Energy, Live Fuels and Solazyme that has recently signed an important development agreement with Chevron.

In fact there are about 40 companies around the world all working on projects to produce biofuels from algae and some of these are already showing some remarkable results.



PetroSun, based in Arizona, has opened a commercial algae-to-biofuels plant in Harlingen, Texas. It gets its algae from a 445 hectare network of saltwater ponds off the Gulf Coast. PetroSun is planning to open more farms in Alabama, Arizona, Mexico, Brazil and Australia and claims that the algae yields 74 times more energy per hectare than other plants. Obviously it does not require fresh water or arable land for its cultivation.

There do not appear to be many companies in Africa that are working on projects to produce biodiesel from algae but an Italian company, Agroils says it will produce about 100 000 tons of biofuel from the jatropha plant grown on African farms by 2018.

The company says it will grow jatropha beans in Morocco, Ghana, Senegal and Cameroon and the oil-rich seeds will be used to make biodiesel. The jatropha plant is extremely hardy and will survive on semi-arid land. It has no value as a food and, in many countries, is regard as a weed.

South African scientists are working on producing second and third generation biofuels from non-food sources such as maize and sunflower oil. Some of the possible non-food crops include grasses, stems, leaves and husks and, naturally enough, algae.

Foreign biofuels expert and American Biofuels Council chairman, Jim Lane says that every country needs to develop a biofuels policy and should look to growing suitable non-food plants that can be used as a feedstock for production of biofuels.

Statistics compiled by the Biofuels Council indicate that total energy needs will increase by about 31 percent over the next 20 years

and greater energy efficiency will be needed to ensure that these energy requirements can be met.

The commercial production of biofuels from algae represents a significant change in focus for biofuel research and development and although there is much debate over the different plants and the different yields advocates of algal fuel say that it can produce about 40 000 litres of fuel per hectare – considerably more than that of plants grown on land.

New water-and-oil extraction technologies are being developed as currently there are some drawbacks when trying to get all the water out of the algae so it can be reprocessed into fuel but researchers say that they have made significant improvements during the last 12 months.

Lane believes that algae will hold the key to renewable energy – at least for internal combustion engines. Some of the intriguing problems facing algal fuel developers include the fact that if certain species of algae are grown in open ponds they are susceptible to viral infections and yields drop dramatically.

Researchers are experimenting with different types of algae to establish which plants provide the highest levels of resistance to infection, coupled with ease of growth in open ponds. Algal fuels are seen as being considerably more sustainable than plants primarily because yields are high, little or no fresh water is required and the ponds can be established in areas where plants do not grow, leaving arable land free for crop cultivation.

Microalgae stores energy as carbohydrates and lipids that can be extracted reasonably easily leaving a waste powder that is high in protein and can be used as an additive in animal feeds. Algae grows between 20 and 30 times faster — in some cases doubling in mass several times a day — than plants and produces at least 15 times more oil than rapeseeds, jatropha, soya beans or other food crops.

In the United States, venture capitalists have already invested more than a billion dollars in projects to make algal fuel and at the National Renewable Energy Laboratory, (NREL) researchers are accelerating their efforts to identify and characterise the most promising strains of algae for fuel production.

The work at NREL has resumed after being largely ignored for the last decade and more. At the moment, the NREL says that algal fuel is not nearly at a level where it can compete with petrol or diesel in terms of price by Al Darzins, group manager and principal researcher at NREL's National Bioenergy Centre, believes it's only a matter of time before this happens.

Darzins says that public interest in algal fuels is increasing by leaps and bounds as hundreds of US and foreign companies look at the opportunities that algal fuels present. However, Darzins says that there is still an enormous amount of research and development needed before the algal fuels will be widely used as a replacement for petrol, jet fuel, diesel or other biofuels.

He says that biological questions about the organisms needs to be resolved and many engineering questions related to fuel production, distribution and quality must be answered. With the oil price currently hovering around $50-a-barrel, algal fuels are also highly uncompetitive at this stage.

He says that algae use photosynthesis to transform carbon dioxide and sunlight into lipids but when the microalgae are starved of the nutrients they need, their lipid content can increase by as much as 60 percent.

NREL and Chevron are working under a co-operative research and development agreement to develop methods of boosting microalgae's productivity and Chevron believes it will be able to use the oil as a feedstock for transportation fuels.

However, Darzins points out that not every strain of algae has all the right qualities to produce algal fuel particularly as different strains have evolved under different conditions in different localities around the world. In fact he doesn't think that a single strain will be suitable for cultivation throughout the world because of the regional difference in climate and water conditions.

However, he does say that the enormous amount of scientific and biological research being ploughed into algal fuels at the moment means that scientists and biologists will have a much clearer understanding of lipid pathways and what is needed to regulate their lipid production and growth.

The NREL is planning to build a range of new outdoor ponds for research purposes that will test algae strains, production systems and harvesting methods on the 40 hectare farm behind the laboratory.

According to the European Science Foundation, research into other sources of energy is also yielding dramatic results. It says that scientific understanding of photosynthesis is creating tantalising prospects of tweaking photosynthesis to produce hydrogen, alcohol or hydrocarbons.

Among experts in the scientific community there is universal agreement that photosynthesis has the potential to provide large amounts of clean energy in the future. Agricultural crops generally convert less than one percent of the solar energy received, into biomass, and as a result would mean that far too much land would be needed to grow crops in sufficient quantities to replace fossil fuels.

Some of the projects being tested by scientists include the development of an artificial leaf to mimic photosynthesis while duplicating itself because photosynthesis is a destructive process that dismantles proteins.

Clearly the development of algal fuels appears to be the most promising alternative to fossil fuels. If the scientific and biological researchers, working on perfecting production methods and plant selection, have their way then it seems that the dominance of fossil fuels in all transportation may finally come to an end.

Aerial shot: Rio Hondo, Texas algae farm.

Creating an artificial 'Big Bang' and a man-made star

The Large Hadron Collider has been fully repaired after the last of 53 replacement magnets was lowered into the 32 kilometre tunnel beneath the Alps on the Swiss-French border. The LHC is due to restart later this year. In September last year the LHC was switched on but, just ten days later, an electrical fault shut it down.

The LHC was built specifically to crash sub-atomic particles together at almost the speed of light to discover what may have happened moments after the Big Bang gave birth to the universe almost 14-billion years ago.

One of the key tasks is to discover if the Higgs Boson or *God Particle* actually exists. Some physicists believe that the *God Particle* explains the existence of matter. There is a chance that once the particles collide, short-lived black holes will be created.

The super-cooled magnets are used to drive the particles around the LHC's tunnel in opposite directions to create the supersonic collisions.

In a separate but equally fascinating project, the Lawrence Livermore's National Ignition Facility is hoping to create, on a much smaller scale, a self-sustaining fusion reaction similar those that occur on the sun.

They will useg 192 lasers and a 120-metre-long series of amplifiers and filters to create controlled nuclear fusion and energy gain for the first time ever in a laboratory. The scientists are hoping that the reaction will release more energy than the lasers fire at the target isotopes.

The lasers are housed in a 10-metre vacuum chamber and are fired at a target that is about the size of a peppercorn. The lasers start out as low-powered infrared light, which passes through a complex series of amplifiers, filters and mirrors to become powerful enough to create self-sustaining fusion.

The beryllium sphere (about the size of a peppercorn) contains the radioactive isotopes, deuterium (hydrogen with one molecule) and tritium (hydrogen with two molecules), which is bombarded with X-rays generated by the 192 lasers. What scientists are hoping is that they will provide enough energy to fuse two nuclei together and create, at the National Ignition Facility, the nuclei of hydrogen

The forces that keep the nuclei apart are so strong that complex engineering and vast quantities of power are needed to fuse the nuclei. To achieve this lasers are converted, by huge synthetic crystals, into ultraviolet light just before they enter the vacuum chamber. Once inside the chamber, the beams enter a reflective shell, called a *hohlraum* (or hollow room) about the size of a marble where the energy generates high-power X-rays.

Scientists hope that the X-rays will be powerful enough to create sufficient heat and pressure to overcome the electromagnetic force that keeps the nuclei separate inside the isotopes. If this is achieved then the nuclei will fuse.

The Livermore Laboratory has tried from more than 35 years to build a laser fusion system but now of the three previous attempts produced enough energy to reach fusion. The first attempt was made using a machine known as *Janus* that create 10 joules of energy and, three years later another laser system, *Shiva* was built and it achieved 10 000 joules.

Members of Fermilab's Technical Division gathered for a send-off celebration for an advanced superconducting magnet (orange) bound for the Large Hadron Collider at CERN

Finally, in 1984 a project named *Nova* managed to produce 30 000 joules, a miniscule amount when compared with the latest system, which is expected to provide 4-million joules of ultraviolet energy, possibly enough to create a tiny star with a positive power output.

To reach this sort of power, the National Ignition Facility uses more than 3 000 pieces of neodymium-doped phosphate amplifier glass to increase the power of the laser beams. The amplifier glass slabs are enclosed in airtight containers within the laser bay.

Each beam zooms through the power amplifier and, when it reaches the main amplifier, a special optical switch called a plasma electrode Pockels cell traps the light, forcing it to travel back and forth four times through 11 sets of laser amplifier glass slabs before it exits the main cavity.

High-power flashguns (similar to those used in an ordinary camera) but much, much larger are used to excite the lasers. When the beam starts out it is about as strong as an infrared beam in a laser pointer but when these are all aimed together and amplified they push out about 500 terawatts of energy in two billionths of a second – more than 500 times the entire peak power output of the United States.

This can be achieved because the laboratory's giant bank of capacitors store a reservoir of energy. However, the bank is dangerous and is placed in complete lock down state because of the risk of high voltage arcing.

Without this switch, the main laser building would have to be about 228 metres longer than it actually is. The beams then make a final pass through the power amplifier before speeding into the target chamber where deformable mirrors, each with 39 actuators, are used to shape the beam's wavefront and compensate for any flaws before it enters an area known as the switchyard.

In the switchyard, a complex system of special mirrors in two ten-storey steel structures, rearrange the parallel, linear array of 192 laser beams into a spherical configuration so that the beams can be focused into the centre of the target chamber.

This switchyard is one of the stiffest structures ever built with walls of just over a metre thick. Each beam passes through the final optics assembly, where it is converted from infrared to ultraviolet wavelength, and is focused through the final focus lens onto the target in the chamber's centre.

From beginning to the end, the beams' total energy grows from one-billionth of a joule to four million joules – a factor of more than a quadrillion – in less than two-millionths of a second.

Superconducting quadrupole electromagnets are used to direct the beams to four intersection points, where interactions between accelerated protons will take place.

The Seven Wonders of NIF

The National Ignition Facility is one of the most remarkable science and technology facilities in the world – alongside, perhaps, the Large Hadron Collider – and is due to start a range of experiments next year. The most important of these is to create nuclear fusion. To create the NIF, scientists, industrial partners and the NIF itself had to overcome a daunting array of challenges. The seven most important achievements were:

- Faster, inexpensive laser glass production. Laser glass is fundamental for the NIF laser system as it amplifies the laser light to the energies required for the scientific experiments. The system uses phosphate glass that has a chemical additive containing atoms of neodymium. There are 3 070 large plates of laser glass that, if stacked end-to-end, would form a continuous ribbon of glass about 2,5 kilometres long. To produce the glass, the NIF joined forces with Hoya Corporation and Schott Glass Technologies and developed a continuous production method that melts and pours glass, which is then cut and polished to specification.
- Large aperture optical switches. A key element of the amplifier section is an optical device called a plasma electrode Pockels cell or PEPC. It contains a plate of potassium dihydrogen phosphate and, in conjunction with a polariser, acts as a switch, allowing laser beams into the amplifier and then rotating its polarisation to trap the laser beams in the amplifier section. A thin plasma electrode that is transparent to the laser wavelength allows the high electric field to be placed on the crystal, causing the polarisation to rotate. The trapped laser beams can then increase their energy more efficiently using multiple passes back and forth through the energised amplifier glass. After the laser beam makes four passes through the amplifiers, the optical switch rotates their polarisation back to its normal configuration, letting them setoff along their path to the target chamber.
- Stable, high-gain amplifiers. The NIF uses 48 preamplifier modules, each of which provides laser energy for four NIF beams. The preamplifier modules receive a low energy (one billionth of a joule) pulse from the master oscillator room and it amplifies the pulse by a factor of a million to one millijoule. It then boosts the pulse again to a maximum of ten joules by passing the beam four times through a flashlamp-pumped rod amplifier. The preamplifiers can perform spatial shaping, spectral shaping and temporal shaping of the input laser beams.
- Deformable mirrors are an adaptive optic system that uses an array of actuators to bend the surface of the mirror to compensate for wavefront errors. There is a deformable mirror for each of the 192 beams.
- Large rapid-growth crystals serve two functions, the frequency conversion and the polarisation rotation. Using special techniques the NIF is able to grow the crystals in just two months and these are sufficiently large to allow plates to be cut from each crystal and fitted to the glass.
- The millimetre-sized target for the lasers must meet extremely exacting specifications with regard to density, concentricity and surface smoothness. Components are machined to an accuracy of one micrometre. To complicate matters, the extreme temperatures and pressures encountered by the targets make them highly susceptible to imperfection in fabrication.
- The NIF has installed one of the most sophisticated computer controls systems ever assembled in government service or in the private sector. Every NIF experimental laser shot means that 60 000 control points for electronic, high voltage, optical and mechanical devices including motorised mirrors and lenses, energy and power sensors, video cameras, laser amplifiers, pulse power and diagnostic instruments must all be synchronised, monitored and controlled. The computer control system will result in the propagation of 192 separate nanosecond-long bursts of light over a one kilometre path length. Each one of the beams must have optical pathlengths equal to within nine millimetres so that the pulses arrive within 30 picosecons (trillionths of a second) of each other at the centre of the target chamber. They must strike to within 50 micrometres on a target measuring less than one centimetre. To put this into perspective, tht like throwing a baseball pitch at a batter from 565 kilometres away.

You can compare Apples with anything you like

Apple's Mac computers have been highly rated in a recent consumer report that compares a variety of different computer system. The MacBook received top honours in the 13-inch category as well as the 14-16 inch category and the 17-inch category. The 15 inch MacBook Pro established the highest score with 75 out of 100 while the Toshiba Satellite came in second with a score of 64.

But it was not all in Apple's favour as its MacMini fell behind HP's Pavilion Slimline. The best all-in-one computer was Dell's XPS rather than the iMac, which many people thought would easily win this category.

In terms of technical support services, Apple took top honours for the desktop and notebook categories. The company achieved an 80 percent solve rate for phone-in services, compared with an industry average of just 60 percent.

Apple's iPhone has show similar results, recently receiving the highest score ever on the JD Power consumer-satisfaction study. The handset received a score of 791 out of 1 000, leading among the smartphone and basic cellphone categories. LG and Samsung scored more than 751 in the smartphone category while BlackBerry disappointingly achieved a score of 739 in terms of consumer satisfaction.

Concrete that heals itself – much like human skin

Research engineers working at the University of Michigan in Ann Arbor have developed a new concrete that can "heal" itself. The new concrete composite can even be bent into a U-shape without breaking and, when strained, it forms hairline cracks that automatically seal after a few days of light rain.

The flexible concrete is just as strong as it was before it developed the hairline cracks.

Experiments done by Professor of Engineering, Victor Li, and his colleagues show that the self-healing specimens recovered most, if not all, of their original strength after being subjected to a three percent tensile strain – in other words the specimens were stretched to three percent beyond their initial size.

It's the equivalent of taking a 30 metre structure and stretching it by almost a metre, enough of a strain to severely deform steel or catastrophically fracture traditional concrete. When it has healed itself, the concrete was found to have the same stiffness and strength.

The engineers did find that cracks in the concrete must be kept to below 150 micrometres and preferably below 50 micrometres to allow full healing. Li and his team have been working on making bendable concrete composites for the past 15 years.

Known as ECC the bendable concrete is studded with specially coated reinforcing fibres that hold it together. ECC remains intact and safe to use at tensile strengths of up to five percent. This compares with traditional concrete that fractures and cannot carry a load at .01 percent tensile strain.

According to Li the new concrete could make structures safer.

Self-healing concrete works because it can bend. When it's strained, many microcracks form instead of one large crack that causes it to fail. Here, a specimen is bending as a force of five percent tensile strain is being applied. Regular concrete would fail at .01 percent tensile strain. Image: Nicole Casal Moore/ University of Michigan

Think about where you're going – and then just go there

Spanish scientists have made a wheelchair that can be controlled by thought waves and this new gadget will allow people with disabilities to think about where they want to go and then get there. The wheelchair uses a laser scanner to create a three-dimensional picture of the area around it, which is displayed in front of the user.

By concentrating on a particular part of the display, the wheelchair responds and follows the directions. A skullcap, fitted with electrodes, is used to detect the brain activity and work out the desired destination.

The wheelchair was developed by Dr Javier Minguez of the University of Zaragoza in Spain. Volunteers who have tested the chair were able to master its control with 45 minutes. According to Minguez, tests have been conducted on volunteers and all the subjects apparently solved the navigation tasks they were given.

The wheelchair is the latest device to be controlled by brainwaves but it is still a long way from commercial development because it can handle just two thoughts a minute. However, Dr Minguez is confident that, in time, a more sophisticated version will be developed that will respond more rapidly to the user's thought.

In 2007, Ambient demonstrated a motorised wheelchair that was controlled by sub-vocal speech. The user thinks of a particular word and a sensor collar around the neck detects the electrical signals sent from the brain to the larynx and compares the signal patterns with pre-programmed words that control the wheelchair.

A similar sub-vocal speech technology has been demonstrated by the National Aeronautics and Space Administration for spacesuit communication devices. In another use of the technology, the collar can be connected to a speech synthesiser allowing the wearing to actually speak.

Throw your coffee cup in your diesel tank

Bung a disposable polystyrene coffee cup into your tank-full of diesel and you can immediately boost your power output by about five percent. The disposable coffee cups work even more effectively in biodiesel as it dissolves almost instantly when submersed in the fuel.

Song-Charng Kong, a mechanical engineer at the Iowa State University in Ames, says the experiment was conducted to find a way to dispose of trash and generate power under battlefield conditions. The study was funded by the United States Defence Department.

Kong and his colleagues dissolved polystyrene into biodiesel at concentrations of between two and 20 percent by weight and found that the increase in power output remained constant.

Tests with a mixed fuel used in a tractor engine to generate electricity, showed that as polystyrene concentrations increased, so the power output increased until the fuel became so viscous that it could no longer combust.

Kong believes the reason for the increase in power is that when polystyrene is added, the fuel gets thicker, creating greater pressure inside the combustion chamber, causing earlier ignition of the fuel and boosting output. When it reaches a concentration of about 15 percent it is so thick that the fuel pump overheats

Polystyrene is traditionally a difficult material to recycle because it is extremely light and is also very bulky, making it uneconomical to ship to recycling plants.

Dissolving the polystyrene in biodiesel doesn't eliminate the harmful emissions though. The researchers found that by adding polystyrene, emissions of carbon monoxide, soot and nitrous oxides were higher because they did not burn completely during combustion.

However, Kong and his team are confident that they will improve the injection systems to achieve a more complete burn and in that way reduce emissions to acceptable levels.

Eat your wing-mirror as you race your chocolate car

A Formula 3 racing car that is made from vegetables and powered by chocolate has been built by British company, ecoF3. The car has a steering wheel made of carrots, a body that has been crafted from potatoes and its racing seat is made from soya beans.

It uses biofuel lubricants formulated from plants and the engine runs on a combination of chocolate extracts and vegetable oil. At least if you're racing, you won't starve – pluck off you rear-view mirror and have lunch. Then toss the other one into the path of a following car so that its drive can have a snack too.

The cars bodywork was created using mixed vegetable fibres combined with resins. The wing mirrors are made from potato starch, while the wing end-plates were made from cellulose and flax.

The wiring loom uses recycled aluminium and plastics while the woven natural fibre is used for the barge board. It has an oxygen-generating catalyst on the radiators that cleans the air as it moves. Recycled carbon fibre is used for the engine cover and damper hatch and non-carbon disks are used for the braking system.

Even the livery and branding are made from plant products. The car is capable of speeds up to 233 kilometres an hour. However, the vehicle cannot be raced in the current (or the forthcoming) series because the engine's unusual fuel means that it fails to meet the regulations laid down by the authorities.

The car was designed and built by the WorldFirst team from Warwick University in Coventry. According to project manager, James Meredith, the car dispels the myth that performance must be compromised when developing vehicles that use materials and fuels other that carbon fibre, steel and racing fuel.

Meredith says the car promotes a different concept of 'green' as it doesn't revolve purely around the exhaust emissions. Max Mosely, President of the Formula One Association has consistently warned that motorsport throughout the world – at all levels – must become more environmentally friendly if it wants to survive and thrive.

Botnets (criminals) capture thousands of bank account details

Criminals controlling botnets (normally in the form of Trojans that can be remotely activated) have taken control of almost 12-million IP addresses since January this year and 18 percent of the botnet-controlled machines are in the United States. The number of these so-called zombie machines represents a 50 percent rise when compared with last year.

According to a quarterly report issued by McAfee, the explosion of botnets is a result of the successful closure of a number of spamming sites that catered to many international firms and syndicates involved in spamming.

Spam levels dropped by about 60 percent when just one hosting facility was closed. In June last year about 153-billion spam messages were being sent out every day compared with figures for March this year, which indicated that just 100-billion messages were now being sent.

The report says that China has the second greatest number of zombie machines at 13 percent, followed by Australia 6,0, percent, Germany at 5,3 percent and the United Kingdom at 4,7 percent. Surprisingly, in Russia where many cyber-criminal syndicates are based, the number of zombie machines was just 2,5 percent.

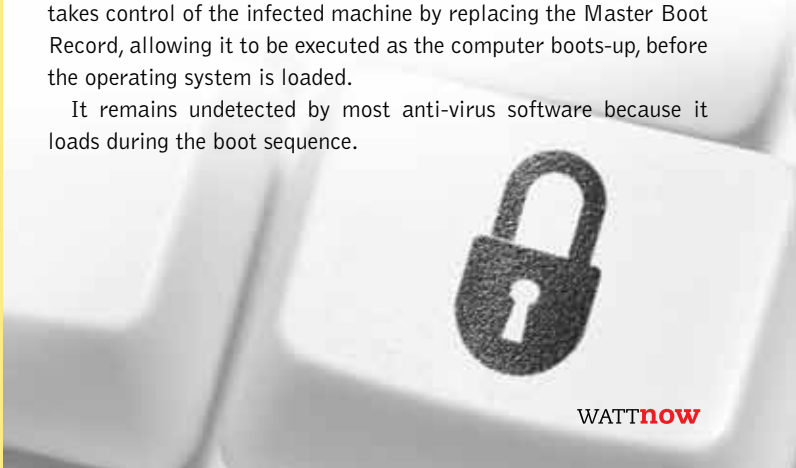
The problem with botnets is that these software packages are not used simply for spam. A report from researchers at the University of California at Santa Barbara tells how they spent 10 days in control of the *Torpig* botnet and observed 70 gigabytes of date being stolen from computers that were remotely-controlled by this software.

The harvested data included 1,2-million Windows passwords and 1,2-million e-mail items such as addresses and log-in credentials. The researchers say that within ten days they had obtained the credentials of 8 310 accounts at 410 different financial institutions.

Apparently the most targeted financial institution was PayPal where 1 770 accounts were stolen followed by *Poste Italiane* with 765, Capital One losing 314, E-Trade accounting for 304 and Chase where account information on 217 accounts was obtained.

Torpig's malware records every keystroke entered on the infected computer and the stolen data is uploaded to a server every 20 minutes. The botnet is controlled by the *Mebroot* rootkit, which takes control of the infected machine by replacing the Master Boot Record, allowing it to be executed as the computer boots-up, before the operating system is loaded.

It remains undetected by most anti-virus software because it loads during the boot sequence.



Poachers being duped by robotic animals

Game rangers working for the United States Forest Service are using robot animals to catch poachers who are illegally hunting bird life and game. The robotic decoys include a swimming moose, a white-tailed deer and a black bear.

Poaching is a relatively severe problem in the United States with conservationists estimating that, for every legal animal hunted during the season, at least one other animal is poached by hunters. The sting operations, using decoys, are saving wildlife from being illegally killed or captured for sale as pets.

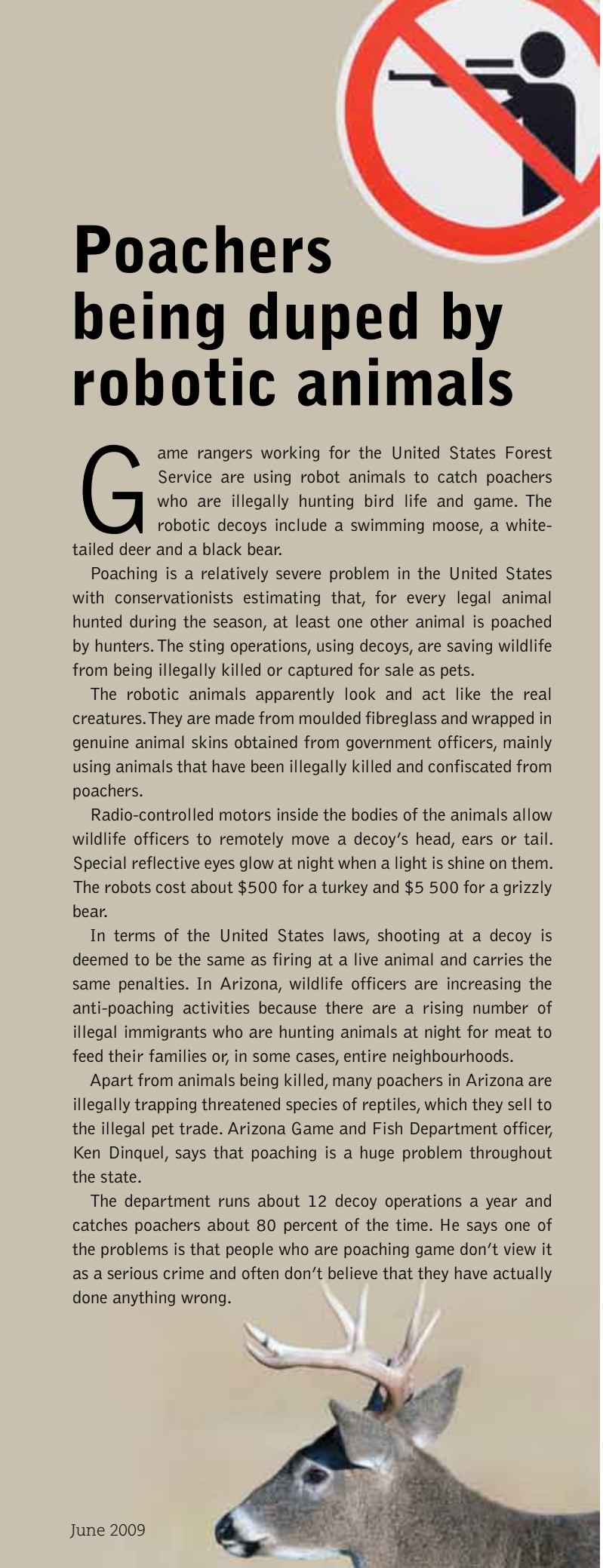
The robotic animals apparently look and act like the real creatures. They are made from moulded fibreglass and wrapped in genuine animal skins obtained from government officers, mainly using animals that have been illegally killed and confiscated from poachers.

Radio-controlled motors inside the bodies of the animals allow wildlife officers to remotely move a decoy's head, ears or tail. Special reflective eyes glow at night when a light is shine on them. The robots cost about $500 for a turkey and $5 500 for a grizzly bear.

In terms of the United States laws, shooting at a decoy is deemed to be the same as firing at a live animal and carries the same penalties. In Arizona, wildlife officers are increasing the anti-poaching activities because there are a rising number of illegal immigrants who are hunting animals at night for meat to feed their families or, in some cases, entire neighbourhoods.

Apart from animals being killed, many poachers in Arizona are illegally trapping threatened species of reptiles, which they sell to the illegal pet trade. Arizona Game and Fish Department officer, Ken Dinquel, says that poaching is a huge problem throughout the state.

The department runs about 12 decoy operations a year and catches poachers about 80 percent of the time. He says one of the problems is that people who are poaching game don't view it as a serious crime and often don't believe that they have actually done anything wrong.



Need answers – you might try Wolfram Alpha

Software that can actually understand a question and provide a tailored answer has been developed by British inventor Dr Stephen Wolfram and has already been demonstrated at Harvard University. Internet pundits believe that the new software is an evolutionary leap in the development of the Internet.

Pose a question such as "How high is Mount Everest" and the software will produce a page of directly related material, all correctly sourced, such as the mountain's geographic location, the nearby towns, other mountains in the range and various graphs and charts.

If you ask the software to compare the height of Mount Everest with the length of the Golden Gate Bridge it will tell you. Alternatively, ask Wolfram Alpha – as the software is currently known – what the weather was like in London on the day John F Kennedy was assassinated it will provide the answer.

Dr Wolfram, an award-winning physicist, has spent years working on the project and has ensured that all the answers provided by the software are assessed by experts in the field before being included in the database. Wolfram has an impressive education, having been schooled at Eton before completing his PhD in particle physics by the age of 20.

The Wolfram Alpha search engine is free for anyone to use and draws on information that is stored in various repositories around the world. He says that about 1 000 people will be employed to keep the database up to date with the latest discoveries and the latest information.

He concedes that the database was designed primarily for professionals and academics so its grasp of popular culture is comparatively poor at this stage. For instance, the search term "50 Cent" caused the software to provide horrendous answers because it confuses the currency with the American rap artists by that name.

Wolfram Alpha is not expected to pose an immediate threat to Google because it is designed for academics and professionals. Google has launched its own professional search software that supposedly can also provide answers to straight-forward questions.

Satellites may soon just 'sail' back to Earth

When William Timlin's beautifully illustrated book, *A Ship That Sailed to Mars*, was published in 1923, it was welcomed as a fantasy tale with wonderful illustrations and a simple storyline. No one, except a few children perhaps, took it seriously. Ironically, scientists today are working on plans to 'sail' satellites and spent rocket stages back to Earth rather than letting them just fall from the sky.

Space is becoming more and more crowded with debris around Earth and scientists are keen to remove redundant objects that could possibly collide with functioning satellites or telescopes. Two European scientists have come up with an idea to extend a sail on an old spacecraft so that its drag increases, allowing it to be sucked into Earth's atmosphere.

At least one firm, EADS Astrium is working on such plans and Brice Santerre and his colleague Max Cerf, have invented the Innovative DE-orbiting Aero brake System (IDEA), which extends booms and sheeting from a spacecraft increasing drag from residual air molecules.

The firm is using what it calls gossamer structures with extremely thin and light membranes. Astrium hopes to use the aero-braking sail on the French Microscope satellite that will investigate the force of gravity and the behaviour of free-falling objects in a test known as the equivalence principle.

The French satellite is expected to take about a year to make all its measurements and after that, it has no use. The aero-braking principle will then be tested. As the satellite has no propulsion system, it will use the gossamer structures to 'sail' back to Earth – a process that could take up to 25 years.

Atrium is also investigating how its IDEAS project could be applied to the different stages of the Ariane rocket launcher. At the moment the main core stage and the solid boosters are used and, once spent, they separate from the third stage and fall rapidly back to Earth.

The third stage then ejects the capsule but it keeps on going, circling the Earth in an elliptical orbit that carries it more than 35 000 kilometres into space before bringing it back as close as 250 kilometres to the Earth. Calculations show that it might take 100 years or more before the third stage falls naturally from the sky.

Santerre and Cerf have calculated that if they were to use the aero-braking concept, with booms and masts, it would need booms about 12 metres high or more and would have to have a surface area of at least 250 square metres.

The operation of the aero-brakes would be controlled by a pre-set timer set to deploy the brake after a certain number of minutes at the end of the flight. Astrium is leading a consortium of companies responsible for producing the Ariane 5 rocket launcher.

Ancient whiskey burnt to prove its authenticity

Bottles of vintage, antique whiskey – often worth thousands of pounds – are being counterfeited by unscrupulous criminals and passed off as the real thing. Now, radioactive material dispersed in the atmosphere by nuclear bomb tests are helping scientists and police fight the illegal trade.

According to whiskey experts, criminals are making thousands of bottles of counterfeit antique whiskey, claiming that they are genuine and are several hundred years old. This, of course, is complete rubbish.

What scientists have found in testing the bottles is that minute levels of radioactive carbon absorbed by the barley as it grew can betray exactly how old the whiskey actually is. Researchers at the Oxford Radiocarbon Accelerator Unit also discovered that they could pinpoint the date a whiskey was made by detecting radioactive particles created by nuclear bomb tests in the 1950.

Moreover, the scientists can use natural background levels of radioactivity to identify whiskies made in earlier centuries. According to Dr Tom Higham, deputy director of the Oxford Radiocarbon Accelerator Unit it is easy to tell if a whiskey is fake if it was produced after 1950 because the minute radioactive particles leave a very distinctive signature.

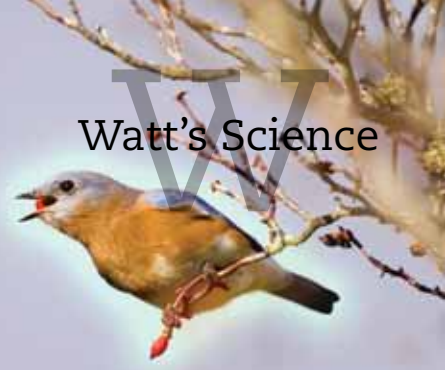
The earliest whiskey dated by the researchers is from the 1700s and many others are from the 19th Century. However, they have been able to prove that thousands of bottles of whiskey being sold as the genuine vintage product are, in fact, fakes.

The researchers use radiocarbon dating, similar to the method used by archaeologists to establish the date of a particular fragment of wood or bone. All living organisms absorb low levels of the radioactive isotope, Carbon 14, which is present in the atmosphere.

Because of nuclear tests in the 1950s, the levels of this isotope in animals and plants have been artificially elevated.

Phials of whiskey, extracted from an antique bottle are sent to the laboratory in Oxford where the scientists burn the liquid and bombard the resulting gas with electrically charged particles so they can measure the quantity of Carbon 14 in the sample.

These tests are extremely effective: for instance, one sample taken from an 1856 Macallan Rare Reserve, that was expected to sell on auction for up to £20 000, turned out to be from a whiskey that had been made in 1950. The whiskey was promptly withdrawn from the auction.



Chernobyl – a wasteland or a paradise for animals?

Scientists and biologists are at loggerheads over the land surrounding Chernobyl which, some say, is recovering remarkably quickly from the nuclear fallout that killed hundreds after the world's biggest nuclear accident in 1986.

Others say that the radioactive fallout is still too high for humans to even venture into the area and that it is damaging plants, birds and animals throughout the exclusion zone.

The city of Pripyat, that used to have a population of 45 000 and was situated close to the Chernobyl nuclear power station, now has a population of zero. All its residents were forced to leave the town. Another 90 000 people living in the surrounding countryside were also told to go leaving a deserted exclusion zone that was completely uninhabited.

Today the land around Chernobyl still has no human life and is left alone and undistrubed for the plants and animals to enjoy – if scientist Robert Baker of Texas Tech University is to be believed.

Scientists recently visited the site and expected to find that much of the animal and plant life would have been killed off by the high levels of radiation. To their surprise, they found the plants and animals were thriving. Species including field mice, moose, wolves, deer, foxes and rabbits roamed around freely.

However, a dissenting scientist Timothy Mousseau of the University of South Carolina says that this is completely untrue. He says that every study done on barn swallows and other birds have shown that the negative consequences of fallout are still present throughout the entire ecosystem of this exclusion zone.

He says that the life span and survival rates of all birds were dramatically reduced after the nuclear accident and it is now extremely hard to find any traces of butterflies, bumble bees or grasshoppers. Ronald Chesser, also of the Texas Tech University, disagrees saying that the exclusion zone around the power station is a "tremendous environmental experiment".

The exclusion zone is enormous, equivalent to 165 000 square kilometres, or about twice the size of South Carolina.

However, Baker is quick to point out that he wouldn't want to "give the impression" that blasts of radiation are good for wildlife. He says the environment is recovering quickly and without the farming and hunting activities – which in his opinion are much worse for the animals – all species are thriving in a natural environment.

Chesser says that entire villages have blended back into the environment and, after 23 years, are so overgrown that it's hard to tell that there once was a village there. Even the streets of Pripyat are hard to walk along, in places, because the vegetation has flourished to such a degree.

In another area, known as the Red Forest, at least a thousand pine trees were killed off by the strong, but relatively narrow, blast of radiation. Today, birch trees, which are much more resistant, have replaced the pine and appear to be thriving.

Mousseau disagrees with Chesser. He says that while some species may appear to be doing better that does not mean that the species themselves are in good condition or are unharmed by radioactivity.

Daydreaming – not idleness but complex brain usage

People who seem to spend more time day-dreaming – and seem to behave like the absent-minded professor, epitomised by Albert Einstein – are actually working harder than many of those slugs who keep busy all day, say neuroscientists working at the University of British Columbia.

They have found that when the brain wanders, it is often working even harder to resolve problems. To confirm this, scientists scanned the brains of people lying inside magnetic resonance imaging (MRI) machines as they alternately pushed buttons or rested.

The scans showed that the default network inside the brain becomes much more active when a person is day-dreaming. However, the surprise finding was that when people were day-dreaming, there was intense activity in the outlying regions of the brain that normally deal with complex problem-solving tasks.

According to Kalina Christoff, head of the neuroscience laboratory at the University, the brain actually turns on when the mind wanders rather than, as most people suspect, becomes lazy and idle while day-dreaming.

She says that people who day-dream are possibly not thinking in the same focused way as they would when performing a goal-oriented task, but they certainly are using more of their mental resources when they appear to be staring aimlessly out of the window.

She says that social conventions take the view that if a person is day-dreaming they are either lazy or idle but in actual fact they are performing more complex mental tasks that those people who seldom day-dream.

Christoff says that day-dreaming is actually an important part of everyone's life and should be encouraged rather than frowned upon. Now what was I writing about. . . ?

Volcanoes, not meteors may have caused mass extinction

For more than 30 years scientists have believed that a giant meteorite that struck Chicxulub in Mexico's Yucatan Peninsula was responsible for wiping out all the dinosaurs that inhabited the Earth 65-million years ago. However, Professor Gerta Kellera, a geologist at Princeton University, New Jersey believes they are wrong.

She says that fossilised traces of plants and animals, extracted from the low-lying hills at El Penon in north east Mexico show that the giant meteorite only struck Earth about 300 000 years after the mass extinction of the dinosaurs.

Kellera believes that huge eruptions from volcanoes in India – known as Deccan Vulcanism – were the actual cause. The eruptions happened on India's Deccan plateau between 63-million and 67-million years ago and spewed vast amounts of sulphur dioxide into the atmosphere.

She says that the meteorite that hit Chicxulub seems to have had no effect on any of the plant or animal life of the region whereas the volcanic eruptions could have blocked sunlight, altered the climate and produced huge quantities of acid rain.

For years, scientists have argued about the actual cause of the mass extinctions, with individuals pointing to one or other catastrophe as the true culprit. Some scientists believe, for instance, that the meteorite that struck South Africa and created the Vredefort Dome may have caused enough of a climatic catastrophe to wipe out the dinosaurs.

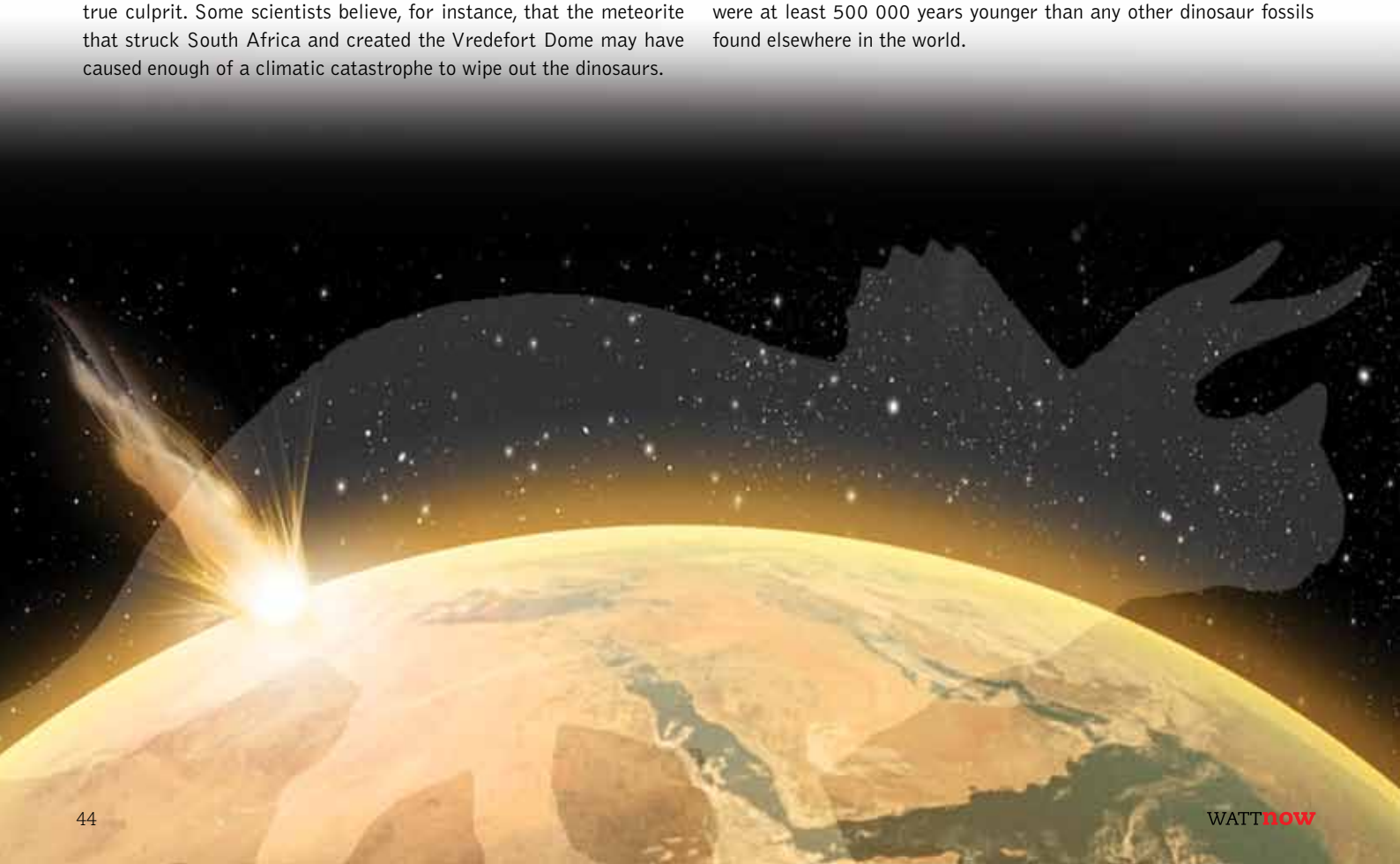
The most common theories include asteroid or comet impacts, eruptions from volcanoes, global climate change, rising sea levels or even supernova explosions. What scientists do know is that about 65-million years ago, some phenomenon triggered an event that killed the dinosaur population on land and in oceans.

To further complicate the debate, experts from the University of Plymouth say they have uncovered new evidence that shows the Earth suffered runaway global warming 250-million years ago, which wiped out between 80 and 95 percent of all species.

Meanwhile another surprising discovery has been made by palaeontologists working on an excavation site in New Mexico. They have found evidence that dinosaurs survived for at least 500 000 years after the mass extinctions 65-million years ago. These dinosaurs were living in a 'lost world' on a rocky, desert plateau in the region.

The scientists found evidence that a pocket of dinosaurs survived and roamed around in New Mexico and Colorado. Carbon dating of the bones, discovered at Ojo Alamo, in the San Juan Basin, proved that these creatures lived for another half-a-million years.

The team working on the excavation found 34 bones from a single hadrosaur and used carbon dating techniques to prove that the bones were at least 500 000 years younger than any other dinosaur fossils found elsewhere in the world.



Herschel and Planck may again provide answers

British scientists, working with a team from the European Space Agency, have launched two of the world's most powerful telescopes into space so that, once deployed, they can be used to look back through time to the birth of the universe during the Big Bang and, perhaps, to a point prior to that.

The two deep-space telescopes, the Herschel and the Planck are part of a £1,8-billion space mission and were launched on the back of an Ariane 5 rocket. Astronomers are hoping that these telescopes will answer some of the most puzzling questions including how the universe came into being, why it looks the way it does and how stars and galaxies are formed.

According to the mission's chief, Professor David Southwood the deployment of the two telescopes will "change our view of the universe and help us to understand where we have come from. We expect to see the origin of galaxies, stars and, perhaps, even life itself".

The 7,5-metre Herschel probe, named after astronomer William Herschel who, among other things, discovered Uranus, will be the largest telescope ever put into space. It is built around a 3,5-metre diameter mirror.

High-tech sensors that detect far-infrared radiation are capable of peering through dust clouds to observe the mysterious processes that allow stars and galaxies to be created.

The Planck probe, named after the father of quantum mechanics, Max Planck, will study the minute fluctuations in the background 'echo' that was left after the Big Bang. This echo is known as the Cosmic Microwave Background and it will help to map the universe in the finest detail so far.

Scientists believe that the results could provide clues to the structure of the universe about 14-billion years ago and could radically alter human understanding of some of the most fundamental principles of physics. Scientists expect the Planck telescope to be able to see the very beginning of time.

Launch configuration for the Herschel and Planck spacecraft. Credit ESA

Some of the fundamental questions that have puzzled scientists for years could be answered by these two telescopes. Questions such as how the intricate structure of today's universe could have evolved from a concentrated point of pure energy following the Big Bang. The physics of the Big Bang remain largely unknown.

The findings could also provide some insight into the much-vaunted string theory, an idea that involves a complex 11-dimensional universe with seven 'hidden' dimensions on top of the four observable dimensions of space and time.

Another exciting prospect for scientists is that they will be able to see into the dust clouds where stars are born. Until now the telescopes have been unable to see inside the space dust.

It has taken scientists more than 10 years to plan, develop and deploy the two space telescopes.

NASA astronauts are all 'a-twitter'

Astronauts aboard the Atlantis shuttle, who have undertaken a high risk mission to service the Hubble telescope are using Twitter to communicate with people back on Earth and let interested observers hear about their progress during this mission.

One of the crew members, Mike Massimino, who blasted off with six other crew members, kept his promised and sent back 'tweets' from space to his fans on earth. His Twitter account, Astro_Mike, kept followers up-to-date with events on Atlantis as it blasted off and reached its orbit.

With a following of more than 200 000 people from all over the world, Astro_Mike started communicating on Twitter during his training in April and he kept it up throughout the mission STS-125, his second trip to space having participated in the Hubble maintenance programme in 2002.

It clearly is a very popular micro-blog so Mark Polansky, who is the commander of the next shuttle mission to the International Space Station, is already providing Twitter updates about his training.

He is scheduled to launch with the rest of the crew in June this year.

He has invited followers to communicate with him on Twitter via Astro_127 and to send him questions via the video website YouTube.

He has promised that he will try to answer all the questions while he is orbiting the Earth.

The Hubble mission is the fifth, and last, maintenance mission to the telescope before the Shuttle fleet is retired within the next 17 months once the scheduled eight new missions have been carried out.

Addis Ababa tracks climate change in Africa

The African Union has set up a satellite receiving station to track the effects of climate change. It is the first station of its kind and is known as the AU-African Monitoring and the Environment for Sustainable Development. The receiving station is based in Addis Ababa and will receive its data from the European satellite agency.

For centuries the African continent has been plagued the inevitable repetition of droughts that last for years, decades or even centuries at a time. These natural phenomena are compounded by the enormous emissions of greenhouse gases that spew out across the continent, contributing to rapid climate change. The receiving station in Addis Ababa was financed by the European Union.

In a separate development, Professor David Block of the University of the Witwatersrand claims that he and his team of researchers have found star-streams in galaxies millions of light years away. He says these star streams could be the missing link in galaxy genesis.

Block says that astronomers have been puzzled by how young stars form clusters in dense molecular clouds and then eventually disperse into other areas of the galactic disc. However, observations of the spiral galaxies of Whirlpool (25-million light years away) and Messier 81 (12-million light years away) indicate that the young stars form into clusters but then seed out in clear dispersion patterns or star-streams.

The star-streams provide a disc-like appearance that categorises spiral galaxies. Star-streams were observed after the National Aeronautics and Space Administration deployed the $800-million Spitzer Space telescope – an infrared observatory that made it possible to identify and study star-streams.

The telescope is able to penetrate dense cosmic dust and filter out older stars from newer ones. According to Block, the infrared images from Spitzer produced pictures that actually revealed groups of stars transforming themselves from dense, irregular patches into mini-spirals.

To identify the arc patterns, a spatial filter and a time filter were used.

Engine from the 1800s to be used on the Moon

Scientists at the National Aeronautics and Space Administration trying to find an engineering solution to a simple, yet very important problem: how to brew a cup of coffee on the Moon. The moon has rare sunlight, no coal or wood to burn and no flowing water to make hydro-electricity.

So NASA has resorted to improving the concept of Fission Surface Power and plan to use an engine invented in the early 1800s by two Scottish brothers, Robert and James Stirling to produce coffee and other warm drinks in space.

The brothers were extremely proud of their invention and named the engine the engine the Stirling. Since its invention it has earned itself an excellent reputation for being the "little engine that could".

According to scientist Mike Houts of NASA Marshall Space Flight Centre, the tried and true Stirling engine is reliable, efficient, versatile, clean and ideal for use in space.

NASA is now partnering with the Department of Energy to develop the fission surface power technology so that it can produce heat and feed this heat into a Stirling engine, which, in turn, can convert the heat energy into electricity to make coffee on the Moon, Mars or any far-off settlement anywhere in space.

Houts says that the power system does not need sunlight to operate and the fission surface power technology could be used to provide power anywhere and at any time. The system could weather cold lunar nights, operate in deep craters that are permanently in shade or in the middle of a Martian dust storm, which is enough obscure the sun.

The power level of the fission surface power system is just one 20 000th of what a reactor on Earth would generate. The reactor would be about 25 centimetres wide and 45 centimetres long and would provide more power with less mass that other power system.

The team is now conducting test in a thermal vacuum to learn about operating and controlling the system on the moon. They are using resistance heaters to simulate nuclear heat.

If the proof of concept succeeds, a reactor will be built from stainless steel and will be fuelled by uranium dioxide. It would be turned on once in place on the lunar surface and would be surrounded by shields to prevent any hazards being encountered from the radiation emitted.

Here's how the system works: inside the reactor are a bundle of small tubes filled with uranium. Outside the reactor are control drums and one side of each drum reflects neutrons and the other side absorbs them, providing a way to control the rate that neutrons escaping the reactor core are reflected back.

To start the unit, the absorbent side of each control drum is turned out, away from the reactor cores so the reflective material faces in and sends escaping neutrons back into the core. The resulting increase in available neutrons enables a self-sustaining chain reaction, which produces heat.

A coolant (in this case, a sodium potassium mixture) flows through the passage-ways between the tubes, picks up the thermal heat produced by the reacting uranium and transfers the heat to the Stirling engine. The Stirling engine uses the heat to make electricity and, of course, the electricity is immediately used to make a cup of coffee.

KZN and Eastern Cape to get subsidised systems

The rural electrification programme is to be expanded with solar home systems being installed in 10 000 houses in KwaZulu-Natal and another 30 000 units fitted to homes in the Eastern Cape according to Vicky Basson, chief executive of KwaZulu Energy Services.

The company, which is 65 percent owned by *Electricite de France* and *Total* planned to eventually install about 50 000 solar home systems in KZN but Basson warns that institutional delays were hampering the roll-out of these units.

The project was started as a partnership between the company and the Department of Minerals and Energy Affairs with the company providing each household with a subsidy of R3 500 for the installation. Basson says that it used the fee-for-service funding model so that households could lease the solar panel and a prepaid meter loaded with a predetermined amount of electricity for a single monthly fee.

The company undertook to maintain or replace the equipment in the event of a failure. The cost for this service for rural households was set at R69 a month after they have paid a R110 connection fee.

According to Basson a household is able to run four energy-efficient lamps, a black-and-white television set and a radio or cellphone charger for up to four hours a day with the electricity provided.

The project in the Eastern Cape is running along similar lines, but Kwazulu Energy Systems has partnered with KFW, a German investment bank, which has provided €16-million for the supply of equipment in the province. The other shareholders in the project will provide €4-million for equipment and a further €4-million for project development and what the company calls "associated costs" including training.

The systems being used in the Eastern Cape are larger than those in KwaZulu-Natal because there are apparently many more cloudy days in that province. The Eastern Cape systems will use a personal identification number rather than a token to recharge the meters and KwaZulu Energy Services says the reason for this is that recharge vouchers will be sent by SMS once payment has been received.

Apparently the company has about a thousand systems ready to install in the Eastern Cape but it is awaiting the appointment of a monitoring consultant by the KFW Bank before serious work can begin.

Referring to the benefits of the solar home system, Basson says that as it is an independent, stand-alone system, it does not needto be connected to Eskom's electricity grid to receive power. She says Eskom is battling to install electricity in rural homes because it first has to provide the transmission and distribution infrastructure before it can individual homes and the costs of this are prohibitively high.

Peru citizens demand change to protect the Amazon

Angry protesters are demanding that the government of Peru withdraw a decree it signed aligning Peru's laws with the free-trade pact with the United States. The protestors are threatening to choke the country's energy supplies if the decree is not overturned.

Protestors are also upset over the oil and natural gas developments that are taking place in the resource-rich Amazon region, believing that the new laws will make it easier for foreign companies to control land in the Amazon rain forest region.

In some regions of Peru, a state of emergency has been declared because protestors are blocking oil pumping stations belonging to the state-run energy company, PetroPeru, says Environment Minister, Antonio Brack.

Similar protests last year forced the company to stop using its northern pipeline for a week. The pipeline pumps about 27 000 barrels of oil a day.

Recently Peru's government auctioned off mining and energy concessions throughout the country – many of them to foreign companies – drawing sharp criticism from environmental and human rights groups who fear that this will create an invasion of foreign investors in the country.

Earlier this year the government signed 13 oil and natural gas contracts and it is planning to auction at least a dozen more in July. All resources found below the ground in Peru belong to the government and not the local communities or the land owners.

Ouch – Eskom wants 34 percent and Jo'burg wants 33 percent too

Eskom is expected to spend another R274-billion over the next three years to fulfil its capital expansion programme and it will probably have to find an alternative funding model for at least R130-billion of this according to Eskom spokesman, Fani Zulu.

So far R141-billion has been guaranteed through a R50-billion government loan and R91-billion in debt financing based on government guarantees. In terms of the existing funding model, Eskom is unable to collect money for its capital expenditure programme by raising tariffs or introducing special levies.

Zulu says that these stipulations have existed for many years but the high costs of capital projects means that Eskom is under excessive pressure with this funding model in place.

The international financial crisis has apparently made it more difficult for Eskom to raise funds on foreign markets.

Meanwhile, Eskom has applied to the National Electricity Regulator of South Africa for a 34 percent hike in tariffs. The application is normally submitted in April but Eskom delayed it submission for a variety of reasons according to company spokesman Fani Zulu.

Johannesburg's Electricity Director, Les Rencontre, warned city ratepayers that they could be faced with an increase of more than 40 percent when details of the Eskom application are provided. The city council has proposed a tariff increase of 33,3 percent, which is due to come into effect in the new financial year starting in July, and this excludes the Eskom application for a 34 percent hike in prices.

Considering that Eskom has now submitted its proposals - which must still be approved - it's likely that Johannesburg residents will face increases that are condsiderably higher than the 33,3 percent the council says it needs.

According to Rencontre, the city already has to pay R280-million more to Eskom in the coming financial year and this alone would translate into a seven percent increase in the tariff charged to residents.

The 33,3 percent increase does not take into account the two cent levy that was imposed by government from April.

The tariff increases for electricity must be finalised before 1 July when the city's new financial year begins.

Corporate planes a No-No in corporate America

Corporations that own company jets are jettisoning these luxuries and it's not because of the energy savings but because a corporate jet is "bad for the company's image and its bottom-line" according to Charles Mayer, vice president of Hawker Beechcraft.

He says that corporate aviation has become a "whipping boy" of modern transportation particularly when motor company executives pitched up in their corporate jets, travelled by limosines to the White House, and promptly begged President Barack Obama to give them enough money to continue trading.

Obama was clearly livid and instructed the company bosses to get rid of the jets before they come to him pleading for cash. They now travel economy class on scheduled flights.

Ed Bolen, president and chief executive of the National Business Aviation Association says there are legitimate arguments for major corporations to own and operate their own planes. Statistics show that just 10 percent of the 5 000 general-use airports in the United States have scheduled airline services and most of the flights serve just 70 domestic markets because airlines cut services to 100 cities in the US in the past year.

Starbucks is one of the US companies that has refused to give up its corporate plane and insists that it is there to provide safe, secure and efficient transportation to key Starbucks executives and employees.

However, Chuck Collins, a researcher with the Institute for Policy Studies, claims that there is no reasonable case for corporate ownership of jets or planes. He has been leading a campaign against the use of corporate jets for years and recently produced a paper entitled *High flyers: How private jet travel is straining the system, warming the planet and costing you money*.

He says that corporate jets harm the environment, clog the air-traffic control systems, create additional security risks and cost shareholders and taxpayers billions of dollars.

General aviation is big business in the US, employing 1,2-million people and generating $150-billion a year. American aircraft manufacturers control more than 70 percent of the global corporate aviation market and almost 50 percent of the planes built in the US are exported to clients in other countries.

The Cessna Citation is the world's best-selling model but other popular planes include the LearJet 45XR, Gulfstream V from General Dynamics and the Hawker 4000.

Cape Town wants special tariffs for IPPs

Cape Town's regional Chamber of Commerce has asked the National Electricity Regulator of South Africa (Nersa) to increase the peak-hour feed-in tariffs for renewable energy so to encourage independent power producers (IPPs) to provide electricity.

It says this will reduce the city's reliance on open-gas cycle turbines, which are expensive to run.

Chamber director, Albert Schuitmaker, believes that if the right tariff structures are introduced then IPPs would be prepared to invest in renewable energy projects such as small hydro-electricity schemes or wind farms.

He also recommended that municipalities in the Western Cape should be encouraged to make and store methane gas from their landfill rubbish dumps and use the methane to produce power to augment Cape Town's peak demand.

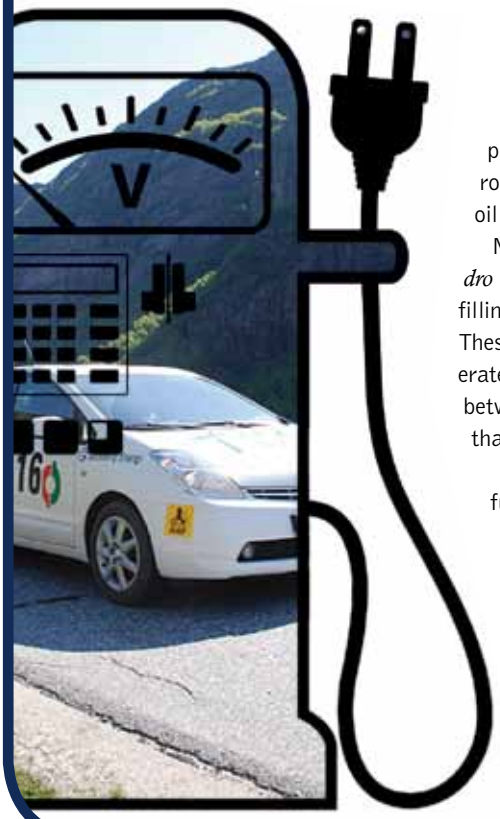
He says that Nersa needs to make renewable energy projects particularly attractive to investors as this, in his opinion, is one of the reasons that so few IPPs have invested in the electricity sector.

According to Schuitmaker, the costs of running the open-gas turbines is excessive, particularly compared with renewable energy resources and he claims that, because of these costs, Nersa shold now grant Western Cape investors higher feed-in tariffs as these would still be lower than the cost of running the diesel-powered turbines.

Nersa's current feed in tariff provides a fee of R1,25/kWh for wind energy, 94/kWh cents for small-scale hydropower, 90/kWh cents for landfill gas and R2,10/kWh for concentrated solar energy with a storage capacity of more than six hours.

IPPs have generally welcomed the feed in tariffs provided by Nersa and investment in the sector is expected to rise soon.

Prince opens hydrogen highway in Norway



A rally between hydrogen-powered cars marked the official opening of Norway's Hydrogen Highway as 12 participants set off on a 560 kilometre scenic road trip between Oslo and the North Sea oil hub of Stavanger.

Norwegian oil and gas producer, *StatoilHydro* had previously erected several hydrogen filling stations along the hydrogen highway. These cater for cars with fuel-cells that generate electricity from the chemical reaction between oxygen and hydrogen or for those that use hydrogen in a combustion engine.

The zero emission vehicles need to refuel frequently because they have a short range, carrying just two kilograms of hydrogen.

Statoil is hoping to eventually link the Norwegian highway to the autobahn in Germany and build refuelling stations all along the route so that drivers of hybrid, electric or hydrogen cars can readily refill or recharge their vehicles.

Rally driver, Henning Solberg, with his co-driver, Norway's Crown Prince Haakon, started the rally with a screech of tyres, in a hydrogen-electric Ford Focus. The first stop along the highway was at Drammen, west of Oslo.

Hydrogen engines are environmentally-friendly and can be refuelled in a matter of minutes. The only emission is clean water rather than carbon-dioxide.

Participants in the rally were driving electric, hydrogen or hybrid cars and these vehicles have excellent acceleration, moving from 0-100 in under four seconds.

However, the rally on the Hydrogen Highway is not about speed but rather about reliability and efficiency according to the organisers, Statoil.

Some of the cars that took part had been specially modified to increase the range and the Statoil-sponsored, hydrogen-powered Toyota Prius was able to do just over 200 km before refuelling.

It used two kilograms of fuel to do the distance in just over two hours. The limited range of hydrogen vehicles is behind Norway's drive to build more stations.

Hydrogen fuel is sold in Norway at 40 Norwegian crowns ($6,28) per kilogram which, Statoil says, is equivalent, in energy terms, to the price of petrol.

Stylish electric motorbike's not for speed freaks

Most motor cycle enthusiasts would not be seen dead riding an electric scooter, a moped or motorised bicycle even though these vehicles might mean that they were not polluting the environment. In fact, no electric or hydrogen-powered motor cycle has come close to giving these enthusiasts the performance they seek.

Until the launch of the Zero which has enough power to embarrass all other vehicles stopped at a traffic light. Neal Saiki, founder and inventor of the Zero motorcycle has produced the Zero S an electric street bike with sharp, attractive style and exceptional acceleration.

The Zero S is quick and nimble with a twin spar frame made from aircraft-grade aluminium giving it an extremely low centre of gravity. The power pack uses the proprietary Z-Force technology that offers exceptional acceleration while each cell in the power pack is individually controlled during charge and discharge via the onboard charger.

The Zero S has custom-built wheels engineered to minimise the unsprung weight and reduce rotating mass. The suspension has an inverted front fork that can be externally adjusted to dial-in compression and rebound damping. A double-diamond rear swing arm and a custom rear shock absorber keeps the rear wheel firmly planted on the ground.

It uses a clutchless one speed gearbox for rapid acceleration and increased efficiency. The direct chain drive provides minimal frictional loss. It provides torque of 84,6 Nm from the 23 kW engine that provides a top speed of just 100 km/h

At this stage The Zero S has a range of between 80 and 100 kilometres but Saiki says that this will increase as battery technology improves.

The Zero S costs about $13 500, considerably more than petrol-driven motorcycles but it does give excellent performance.

Wireless charging for a wireless cellphone

Palm's Pre mobile phone is likely to be the first phone in the world to feature a wireless charger that uses magnets to deliver an electrical charge.

A current passes through a coil embedded into the charging pad, generating a magnetic field which, in turn, generates a charge in the Palm Pre's magnetic coil, powering the battery.

The system, known as Touchstone, will need to be connected to a wall socket, although the phone itself will not use wires to charge. It will take about four hours to recharge the phone using this magnetic induction technology and opens the way for consumers to charge a number of other gadgets using a single charging pad.

Scientists and researchers around the world are working on ways to build wireless electricity into homes and offices so that devices, such as television sets, computers or small appliances can be powered in any location rather than having to be set down near a plug-point.

Last year, Intel demonstrated a wireless electricity prototype that was able to power a 60 Watt light bulb from an energy source situated more than a metre away. However, researchers must still find a way to make magnetic coils that are small enough to fit inside various different gadgets while still providing the same amount of power needed to run the device.

Various consumer electronics companies, including Philips and Sony have formed the Wireless Power Consortium to develop a universal standard for magnetic induction technology. Wireless charging mats are already available from a company called Powermat but each gadget must be placed inside a special case for the charging process to work.

However, researchers are confident that, within the next few years, there will not be a need for special cases, sleeves or trays to charge individual devices as wireless electricity will, in future, be present in public spaces in much the same way as wireless computer networks are freely available today.

Palm's Pre mobile phone – dubbed as a rival for the hugely popular iPhone – will be available in the United States later this month. There are no indications of what the new phone will cost.

Idols winners – fiasco means they share prizes

M-Net has blamed its service provider, Grapevine Interactive for the fiasco during the idols contest when hundreds of SMS messages were not received before the cut-off period. As a result, Sasha Lee Davids and Jason Hartman will share the prize.

The technology collapse has been blamed squarely on Grapevine and company representative, Nick Orton has confirmed that the number of SMS messages it received was so high that it was unable to cope. He says the company had planned for twice the number of votes it received last year but during this year's final there were actually five times more votes.

Grapevine has apologised to the contestants and the fans for the under-capacity and its failure to get the messages through before the final result was announced.

When the fiasco was discovered, M-Net, Vodacom, MTN and Cell-C all leapt onto the band-wagon, each one trying to absolve themselves from blame and pass the responsibility buck to another party.

However, intensive investigations by the network operators showed that, without a shadow of doubt, the problem had been Grapevine's bandwidth.

Over the past few months, cellphone users have been decrying the service they received from all three networks and there is now a detailed investigation underway to pinpoint the problems.

MTN has blamed Telkom and Eskom for the bulk of the network problems but Telkom has refuted this saying that whenever the mobile phone networks give problems the fixed line operator is immediately blamed for the problems.

Until the results of the investigation into the network services are released its likely that cellphone users will have to bite the bullet and get used to dropped calls, failed SMS messages and not being able to connect at all.

And listen, interminably, to one company blaming another.

Isotope shortage looms as reactor shut down

A Canadian nuclear reactor used to make radioactive isotopes mainly for the medical industry has been closed after authorities found that it was leaking a small amount of heavy water used as part of the nuclear reaction process.

The shutdown came after power outages caused a failure in the heavy water disposal process, which was leaking at a rate of about kilograms an hour. Technicians identified the leak at the base of the reactor vessel and immediately began collecting the heavy water in drums to prevent any environmental damaged while the plant was shut down.

The 50-year-old reactor, belonging to Atomic Energy Canada, will be closed for at least a month and this may result in a shortage of medical isotopes on the international market. Various companies in different countries are working with Atomic Energy Canada to ensure that there are no crucial shortages of medical isotopes.

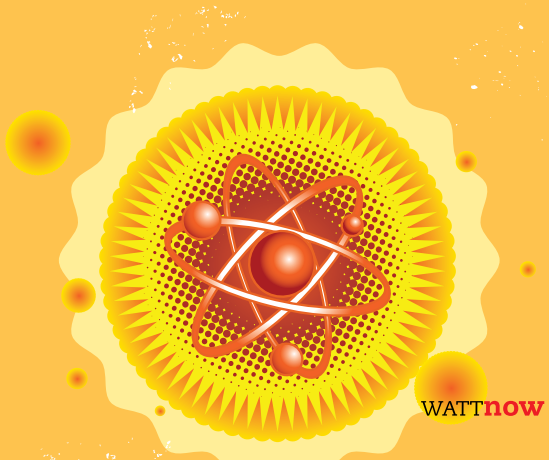
Canada's Natural Resources Minister Lisa Raitt says the possible shortage of isotopes would have international repercussions because these isotopes are fundamental for certain cancer treatments and without them, treatments must be stopped.

Apart from the cancer treatment, the isotopes are used for diagnostic purposes for cancer, heart disease and other medical conditions. When the isotopes are injected into the body, they give off radiation that can be imaged with a camera to provide an accurate diagnosis of a particular condition.

The closure of the isotope production plant will reduce the company's earnings by about $4-million a month. This is the second time in two years that the Chalk River production plant has been closed.

In 2007 the company had to make modifications to the plant so that it could install two new motor starts for the reactor's cooling pumps and connect these motors to an additional back-up power supply.

The reactor supplies about 50 percent of the isotopes used throughout the world.



Eskom applies for huge tariff hike to support its capital expansion plans

After much speculation, Eskom has finally applied to the National Electricity Regulator of South Africa (Nersa) for a 34 percent increase in its tariffs claiming that, without this money, it will not be able to continue with its huge capital expansion programme and will be unable to generate enough electricity for South Africa.

The application has been greeted with howls of protest from various groups who say that this sort of price increase will cripple some of the businesses that are teetering on the edge of financial collapse. Moreover, the Congress of the South African Trade Unions (Cosatu) has demanded that Nersa immediately reject the application.

However, last year when Eskom applied for a mammoth 63 percent increase – which eventually was reduced to 27,5 percent – it warned that significant price increases would follow in the years ahead particularly as South Africa's electricity prices are among the lowest in the world.

Interestingly, the Johannesburg Metropolitan Council warned residents that it would raise its tariffs by 33 percent from June, excluding any further increases from Eskom. Other municipalities around the country are likely to pass the Eskom hike on to consumers but the knock-on effect is that the municipalities buy electricity at the bulk rate and then add their margin to that.

Effectively it means that South Africans will be paying a lot more for the energy they consume.

Cosatu says that the massive increase envisaged by Eskom will inflict misery on thousands of poor households who would have to give up using electricity at all. The organisation says it is not opposed to "an increase that reflects genuine increase in running costs. . ." and it says that an increase of about 8,5 percent would be more accurate.

Cosatu contends that it is not the consumers' fault that Eskom does not have sufficient money to complete its impressive building programme but it questions whether the utility should be able to raise money from consumers to complete the new power stations.

Cosatu plans to take its concerns to the National Economic Development and Labour Council and will resort to mass action throughout South Africa if Nersa ignores their demands and grants Eskom a price hike of 34 percent.

Economists are not as scathing about the price increase as Cosatu is and many believe that Eskom will get its way because of the shortages that occurred last year, bringing the mining and industrial sectors to a standstill for five days.

Eskom spokesman, Fani Zulu, says that most of Eskom's stakeholders, including the government realise that the expansion programme is imperative for economic development.

Eskom's proposed increase is a stop-gap measure that, it says, will soften the gap later and will help consumers adjust to the higher prices of electricity, which are essential given the capital expansions programme, the high cost of building new power stations and the equally high costs of keeping older power stations running.

Eskom has repeatedly warned South African consumers that they can expect significant prices rises from the utility to not only bring it into line with electricity prices elsewhere in the world but, more importantly, to allow it to invest in the new capacity that is so urgently needed.

Eskom's contention is the tariffs should reflect the true economic cost of electricity and not just simply an increase from a low base price to a higher price. Eskom does say that once prices are in line with the costs of generating and maintaining the electricity grid then price hikes will be in line with the inflation rate and other economic targets set by government.

Eskom has called for changes to the regulatory environment that will allow it to accumulate money to fund infrastructure development and still retain a healthy balance sheet that will allow it to raise debt.

Eskom says that it is working on a new funding model and will probably be ready to submit it to government by September this year. The preparation of this new funding model is believed to be the main reason that Eskom has delayed the submission of its multi-year price determination for 2009/10 and 2011/11.

Last year, Eskom warned that its tariffs were likely to rise by between 20 percent and 25 percent a year for the next three years but worsening economic conditions since it made that assertion have apparently forced it to apply for an even higher tariff increase.

Effective education needs everybody

By Nhlanhla Maphalala - chairperson of Bergville Community Builders (BCB)

A chance encounter between the former President of SAIEE, Viv Crone and myself after a presentation by the former Eskom chief executive, Ian McRae, at the University of Johannesburg, led to a strong, useful and empowering relationship building up between BCB and SAIEE over the years.

As I recall, Viv was in great demand that day, so I was skeptical as to whether, after our short discussion he would remember anything let alone act on it. After all, Viv was clutching a stack of business cards, held informal talks with all and sundry and a man who was obviously as prominent and busy as he was would hardly remember our brief discussion.

I made up my mind that I would have to use other means to get his attention and to explain to him just what it was that we wanted to do for the Bergville community.

So it came as a complete surprise to me when an email arrived from Viv asking to meet with us to discuss what BCB and what it is doing for the schools in Bergville. We arranged to meet and it was at this meeting that the relationship between the two organisations started to flourish.

Soon we had our first real experience of the SAIEE team (See pic 1). They came to Bergville during our Careers' Day workshops in January 2007, and it was hear that they could see, first hand, the scale of the problem we face with the number of learners who need proper teaching. It was here, too, that the SAIEE were exposed to the real challenges facing rural high schools.

We outlined, to the SAIEE, many of the difficulties that must be overcome, discussed the style of education, the level of understanding of certain technical concepts, our language and cultural differences and so forth. And, throughout our discussions it was particularly encouraging to see and hear the SAIEE team's complete commitment to quality education.

In fact, I remember Viv saying: "Education needs every one of us – because then our nation will be successful. All professional people need to give community schools a hand, they need to pass on their experience and knowledge and in that way, allow all of us to work together to meet the challenges that lie ahead."

Since then Viv and the SAIEE have stood by this commitment. We now have the SAIEE involved in the National Science Week and Grade 9 Career Awareness Days. We have tutoring projects for maths and science learners.

We have a growing interest in science and maths among our students and we have seen improvements in the marks that each learner achieves. In fact, for the first time in our history, we've had learners achieve A's and B's in science and mathematics from the Bergville district, in last year's national examinations.

This is due, in part, to the holistic approach the BCB and the SAIEE has taken to addressing the shortage of educators for maths and science.

Often, school principals are forced to use educators who have scant knowledge of science or maths because of the shortage of teachers who are qualified to teach these subjects. So the principals have to make do with teachers who, often, have not been trained to teach maths or science.

Through working with the SAIEE, we devised a way to train the educators ourselves and equip them with the much-needed skills and material that allow them to effectively communicate scientific or mathematical concepts to their students.

This has been achieved through a joint initiative between Spescom, SAIEE and the University of the Witwatersrand, post graduate students who conduct monthly workshops for two days each month. These students focus on training the educators and guiding them in areas that are not familiar to them because we have a new education system and a new curriculum.

Furthermore with the students teaching the teachers, we are able to expand their knowledge through practical demonstrations of various concepts that are normally quite difficult to grasp.

I believe that by working with SAIEE we are now starting to see a lot of improvements in our rural schools. The participative engagement of SAIEE, BCB and other institutions, in meeting and resolving the maths and science challenges in the Bergville area, we are better off as a community and we are better equipped to face the future with confidence.

I must reiterate that we deeply appreciate this support. I look forward to the day when the whole of Bergville becomes a better place to live and go to school because we are surrounded by a well-educated population and we offer our learners a level of education that is unsurpassed in other rural schools.

It might be a dream, but with the continued support of the SAIEE, Spescom, Wits and of course, the BCB, it's a dream that, one day, we will fulfil.

Nhlanha can be reached via his e-mail address: Nhlanhla. maphalala@pbmr.co.za or by mobile phone on 084-812-3671.

Southern Cape Centre visit to Plettenberg Bay Waterworks

By Johann Swanepoel

The Southern Cape Centre recently enjoyed a comprehensive tour of the water schemes providing Plettenberg Bay and Nature's Valley with tap water.

The tour opened with a presentation by Pikkie Lombard, the waterworks manager, on water quality and public health, explaining the hazards associated with impurities that may occur in water supplies. He also answered questions relating to water from taps, boreholes and rainwater tanks, giving advice on utilisation, sterilisation and filtering. There was a discussion on different treatment methods used by local authorities, more specifically flocculation, chlorination and ozone treatment.

Members were given a conducted tour of the Plettenberg Bay treatment works, where these two purification methods are employed, before travelling to Nature's Valley to see the ozone plant there.

All then travelled back to the main extraction point on the Bitou River, where the pump station is situated, feeding the large storage tank on the hill above, from where there is a gravity feed back to the town.

It was encouraging to hear of the high standard of water quality being achieved, and the constant monitoring to ensure consistent standards. A concern, however, was the general poor standard of equipment, plant maintenance, and housekeeping at some of the sites visited. This also directly impacted on the safety and security of the sites, which need serious attention.

The visit ended with a braai at the pump station, which was enjoyed by all.

Technical programme from SABS available

The South African Bureau of Standards has released a list of all standards projects in progress at the bureau, which is available as a download from the SABS website in PDF format. The publication contains:

- Standards reference numbers;
- Target date for completion;
- Proposed standards titles;
- The relationship with international standards (if any);
- The stage of development;
- The number of the technical committee;
- The ICS number.

The technical programme is issued by the SABS on a bi-annual basis (April and October).
Request for a free printed copy of the SABS Standards Technical Programme is available on request.
The SABS can be contacted on **012-428-6666**

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