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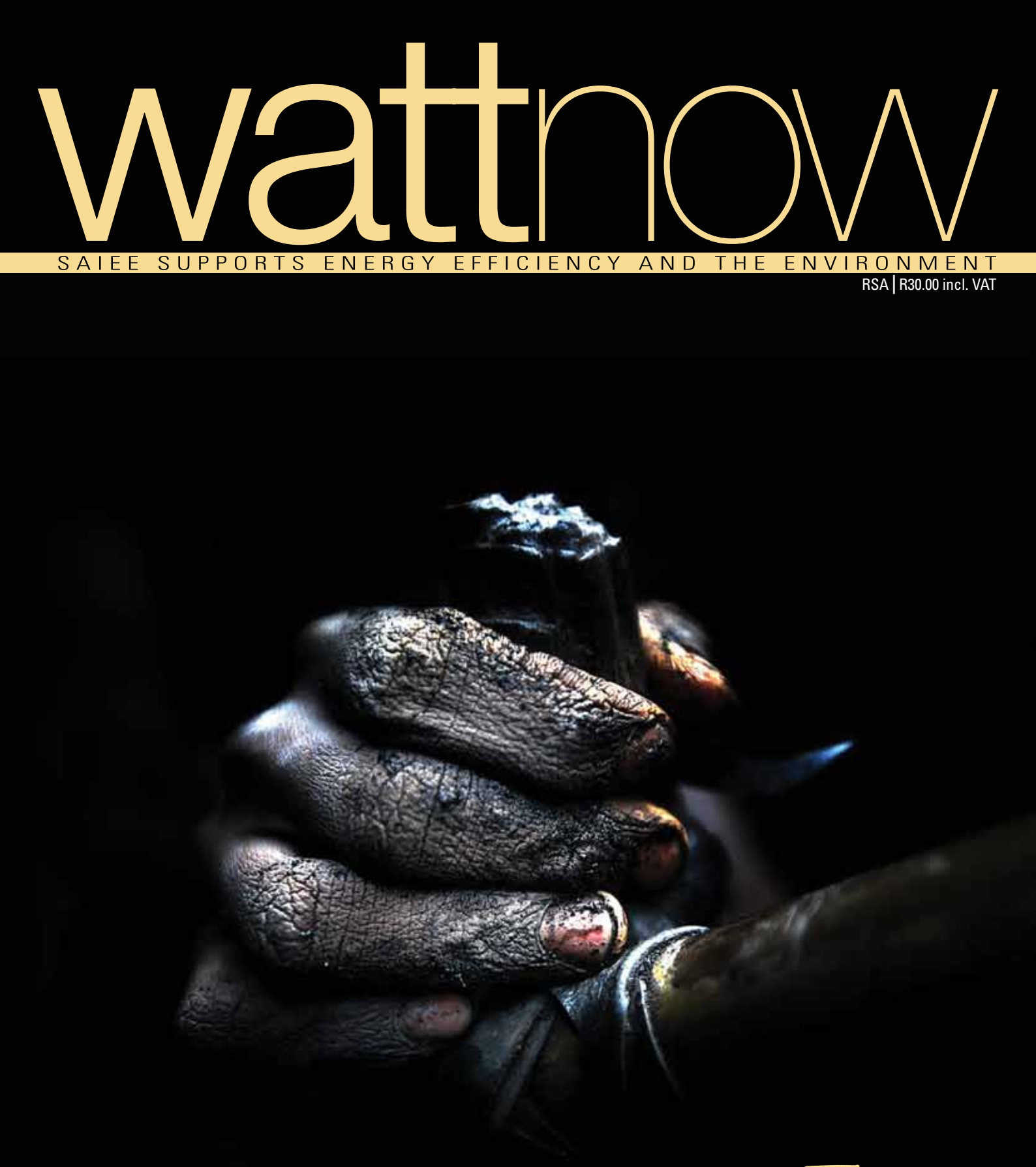

Featuring
MINING

SAIEE THE OFFICIAL MOUTHPIECE OF THE SOUTH AFRICAN INSTITUTE OF ELECTRICAL ENGINEERS | **AUGUST 2014**

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wattnow magazine

MANAGING EDITOR
Minx Avrabos | minx@saiee.org.za

EDITORS
Derek Woodburn
Jane-Anne Buisson-Street
Mike Crouch
Dr Michael Grant

CONTRIBUTORS
Sizwe Timothy Phakati
Jack Ward
Kobus Griesel
Dudley Basson
Jane Buisson-Street
Wolf Weidemann
Angela Price

EVENTS
Gerda Geyer | geyerg@saiee.org.za

CPD & COURSE ACCREDITATION
Sue Moseley | suem@saiee.org.za

MEMBERSHIP & TECHNOLOGY LEADERSHIP
Ansie Smith | smitha@saiee.org.za

ADVERTISING
Avenue Advertising
T 011 463 7940 | **F** 086 518 9936
E barbara@avenue.co.za

PUBLISHER
South African Institute of Electrical Engineers

SAIEE HEAD OFFICE
P.O. Box 751253 | Gardenview | 2047
T 011 487 3003 | **F** 011 487 3002
E wattnow@saiee.org.za | **W** www.saiee.org.za
Office Hours: 8am-4pm

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August is upon us, and with it comes Mother Nature's broom sweeping all the old leaves and winter cold to make way for the sultry summers. With this, August also means its women's month with National Women's Day being celebrated on the 9th of August. I wish all my female readers a wonderful Women's Day.

This issue of **watt**now focuses on Mining, and with the recent upheavals with the 5 month strike in the Mining sector, I thought it apt to publish the article, written by Sizwe Phakati "Getting on and getting by underground", pg 26. He worked with miners underground for 6 months in order to complete his study on ethnography. He takes a look at mining from the miner's point of view.

Our solar section sports an article from Jack Ward on how solar/diesel hybrid power gains ground in mining applications. Read more on page 40.

Kobus Griessel wrote an article on "Ethernet Acceptance Testing" which you can find on page 46. Herein he comments about the common misconception about network systems, which we all assume either works, or not at all. Well, actually, it just has to be tested with the right software and equipment.

Our constant **watt**now contributor, Dudley Basson has done it again! He wrote a lovely article on Astronomy, "ALMA Eyes the Cosmos". Here he gives us an in-depth look at the recently opened Llano de Chajnator of the Atacama Desert in Chile. It being one of the largest, and most expensive observatories in the world. Read the story on page 50.

Herewith the August issue, enjoy the read.

Minx

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Greetings to all our Members from SAIEE House, Johannesburg.

The call for "Engineering Electrical Engineers for a World Class South Africa" was delivered to all our Centres. Thank you to our Centres for the warm reception and support of encouragement.

Thank you to Dr. Musaba and the Southern African Power Pool for the delivery of the President's Invitation Lecture at the University of Johannesburg. A full house was informed of the workings and forward plans for the Southern African Development Community.

Thank you to the Power and Energy Section for the Eskom Lethabo Power Station Engineer Forum. The event was attended and supported by Senior Eskom Management, local power station staff, the SAIEE Vaal Centre and SAIMechE's Vaal Centre.

Our hard work of encouraging engineers to take up membership of the Institute is yielding rewards. In particular, our profile in gender equity is improving. In the month of August, we will celebrate Women's Day. We will use the opportunity to focus our efforts on growing further our *"Lady in Engineering, Science and Technology"*. Let us all encourage our daughters of South Africa to pursue a career in electrical engineering. Diversity is strength.

The focus on our student membership gathers momentum. With increasing student members and activities, student leaders are planning to establish a Student Council to lead, manage and co-ordinate student activities. This is another step towards empowering our students to take care of their growth, training and development requirements.

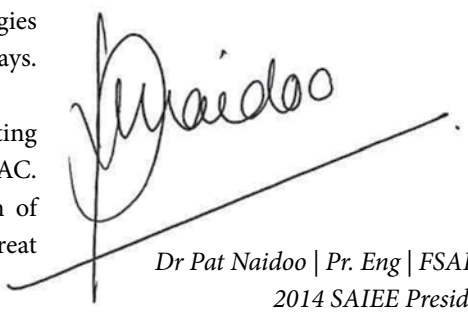
The London based British delegation from the Institute of Engineering and Technology visited us at SAIEE House recently. We set aside two days for discussions on joint co-operation and workings of our respective institutes. Agenda points included *"Chartered Engineer"* branding for our members and the active promotion of new technologies in electric mobility; vehicles and railways.

In August, South Africa will be hosting the 19th World Congress of IFAC. IFAC is the International Federation of Automation and Control. This is a great opportunity for members to attend and participate in an international event at home.

Automation and Control will define the new era of robotics. Robotics will impact on our future work methods and practices. The large scale applications will be in jobs associated with safety and occupational health risks such as in deep underground mining. The emerging challenge will be job displacement; robots versus humans. We as an Institute must help find answers on sustaining and promoting jobs given the advance of technology.

We are now at mid-year of the 2014 administration of the Institute. Our revenue is ahead of budget. Expenses are tightly managed. Our investments continue to track the good performance of the JSE; mostly emanating from the blue chip companies that are listed locally but working hard globally. South Africa needs to get down to serious hard work with improved productivity. The honeymoon with change is over. The time has come for serious delivery of sterling results. Let us all put effort into all our daily activities and push ahead with the dream of a World Class South Africa.

Keep safe and be strong.



Dr Pat Naidoo | Pr. Eng | FSAIEE
2014 SAIEE President

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WATTSUP

SAIEE President's Invitation Lecture

From L-R: Stan Bridgens (CEO, SAIEE), Prof Bhekisipho Twala (HoD Faculty of Engineering & Built Environment, UJ), Dr Lawrence Musaba (guest speaker), Dr Pat Naidoo (SAIEE President) and John Gossling (SAIEE Past President).

Dr Pat Naidoo, SAIEE President, invited Dr Lawrence Musaba, Coordination Centre Manager at the Southern African Power Pool (SAPP) to be the guest speaker at the annual SAIEE President's Invitation lecture. Even though it was a very cold evening, the Hotel School Auditorium at the University of Johannesburg was abuzz with excitement and anticipation of Dr Musaba's presentation. Musaba presented a paper on the generation and capacity shortfall in the Southern African Development Community (SADC) region.

Dr. Musaba is instrumental in the development and operation of a competitive power market in the Southern African region. He has written numerous papers on the subject and together with his team and Nord Pool, developed a competitive electricity market for the SADC in the form of a day-ahead market (DAM). The market was opened and launched in December 2009 for live trading. The SAPP is now working on the development of the ancillary services market, a financial market and a balancing mechanism.

The Fairbanks Morse team, based in the USA, visiting South Africa, seen here with Viv Crone (SAIEE Past President).

Dr Pat Naidoo, Dr Lawrence Musaba, Lovemore Chilamanzi & Morgan Sithole (Eskom).

L-R: Tiego Moroaswi, Thinus Du Plessis & Patrick O'Halloran.

L-R: Derek Woodburn & Tom Beggs.

L-R: George Debbo, Mike Crouch, John Gossling & Viv Crone.

SAIEE reinforce its ties with IET

The IET EMEA-CC delegation, from L-R: Carlena Probert-Baulch, Janice Mann, Steven Nkweto, Christopher Bruce, David Houssein, Gerda Geyer, Iain Murdoch (EMEA CC Chairman) and Pat Naidoo (SAIEE President).

The SAIEE played host to the Institution of Engineering & Technology (IET) delegation from EMEA-CC (Europe, Middle East & Africa Communities Committee).

The IET has 160 000 members in 127 countries and is 140 years old. It focuses on multidisciplines in the engineering sector. The 6700 IET members in the EMEA region, have their own committee, wihch consist of 7 volunteer members, which is chaired by Iain Murdoch.

Iain gave us a brief introduction about the IET, and sharing with us how the IET and SAIEE can work together as both our Institutes have a common goal.

A Memorandum of Understanding was signed between the SAIEE and IET.

The Institution of Engineering and Technology

New era in automation control begins

Schneider Electric, a global specialist in energy management, has launched the new Modicon M580, a pioneering automation controller, which is the key component of the company's integrated automation architecture: PlantStruxure.

M580 is the world's first ePAC, the next generation PAC (Programmable Automation Controller) based entirely on Ethernet. It gives industrial plant teams the power to design, implement and run a process that actively employs all the benefits of open networking, such as increased visibility to key process data and events, enhanced transparency and consistency of information, and large capacity for data traffic.

The core of the new cutting-edge Modicon M580 is the SPEAr microprocessor that embeds inside the controller standard unmodified deterministic Ethernet and applies it to all communications, including all the way to the backplane.

According to Steve Gerber, product marketing manager at Schneider Electric South Africa, the result is an outstanding level of transparency and performance, without any need for manual configuration of each connected device.

The SPEAr technology applies Ethernet communications to the field bus, control bus, and internal backplane bus and, consequently, to all the connected equipment and modules. Ethernet is also automatically applied to every device in the network, such as electrical distribution, low-voltage boards, and energy management functions to form a complete and open system.

WATTSUP

New Circuit Breaker Sockets from Crabtree

Crabtree has released details of its new Circuit Breaker Sockets designed to protect critical current equipment. The product range ensures that users do not exceed the rated capacity of the circuit breaker, providing safety in the application.

A normal switched socket, when overloaded, causes the circuit breaker at the main distribution board to trip, resulting in all sockets connected to that specific circuit breaker to be disconnected from power.

Crabtree's newly designed single pole circuit breaker, switches the live wire similar to a normal switched socket. However, by having a circuit breaker next to the socket, rated lower than the distribution board circuit breaker, the overload situation to that specific socket is isolated. Other sockets on the same circuit are not affected allowing the remaining circuits to continue protecting related equipment and appliances.

The new circuit breaker sockets are ideal for use in laboratories, university dormitories, hospitals and in any situation where critical loads need to be regulated.

LEM solutions for traction measurements

Power electronics is essential to drive and control energy in rail transportation systems. LEM has been a main player in traction power electronics applications and development for the last 35 years and leverages this vast experience to supply solutions for isolated current and voltage measurements.

LEM transducers provide control and protection to power converters and inverters that regulate energy to the electric motors for propulsion and to the auxiliaries for air-conditioning, heating, lighting, electrical doors, ventilation, etc., for on-board applications.

LEM is also able to provide on-board or substation monitoring of DC power consumption via the EM4T II Energy Meter. LEM also offer solutions for trackside applications, eg., substations, voltage and current monitoring and control of points machines and the status of signaling equipment with new transducers optimized for these applications.

Three decades of railway experience has contributed to establishing LEM as a market leader with a worldwide presence for the efficient, safe and reliable operation of railways. With more than 2 500 current and voltage transducers in its portfolio, LEM offers a complete range of accurate, reliable and galvanically isolated devices for the measurement of currents from 0.1A to 20 000A and voltages for 10V to 6 400V in various technologies; Open Loop, Closed Loop, Isolation amplifier, etc.

LEM transducers for railway applications are designed according to the most demanding international standards (EN50155, EN501241, NNF16101, 16102, etc.) LEM have worldwide ISO 9000 production and design centers and offer a 5 year warranty on all products.

Examples of the latest traction voltage and current transducers are shown in the photo. For more information, please contact Denver Technical Products (Pty) Ltd.

AFL's launches newest optical time-domain reflextometer (OTDR)

AFL, represented by Comtest, has announced the release of the latest addition to the M-series OTDR family - the M710-40 model. AFL has added TruEvent advanced analysis to this popular large screen unit as well as optics that provide 44/42dB of dynamic range at 1310/1550. This is AFL's longest range OTDR and has all the performance needed for virtually any network testing needs. Applications include:

- Tier 1 and Tier 2 testing and reporting of SM and MM networks
- Test and certify campus & central office networks
- Inspect fiber endfaces using DFS1 Digital FiberScope
- Test Distributed Antenna Systems (DAS) fiber infrastructure

The M700 / M710 OTDRs combine industry leading event analysis (TruEvent Technology) with ease of use (Touch and Test®), in a rugged, hand held package. With a single mode dynamic range option of 44dB and several other models, the M700/710 OTDRs are ideal for testing and troubleshooting LAN/WAN, metro, FTTx and long haul networks. Industry leading dead zones of less than 1.0m also improve the user's ability to locate and measure events.

The M700/710 supports Full Auto, Expert (manual) and Real-Time OTDR test modes, multi-wavelength testing, and visual inspection using the DFS1 Digital FiberScope. This allows users to view and then document connector end-face images along with their OTDR traces.

Pass/Fail acceptance to TIA/ISO values or user-defined values can be set to alert the test operator of failing or marginal events. These capabilities simplify the user experience and reduce training time and errors. The easy to interpret pass/fail event table enables even novices to get the job done quickly and accurately - reducing the cost of testing and troubleshooting.

Thousands of OTDR test results may be saved as standard .SOR files and stored internally or on the supplied USB drive. Test results are transferable via a USB cable or USB drive to a computer for analyzing with the supplied Windows® compatible Test Results Manager (TRM). OPM loss values for a cable in one or two directions can be displayed in a table on the M700/710 for evaluation and comparison. Acceptance reports generated using TRM can include loss tables, OTDR traces with summary and event information with pass/fail indication and Channel Maps.

The M700/710 comes complete with TRM Certification Reporting Software for comprehensive reports compliant to TIA/ISO guidelines. For more info, visit www.comtest.co.za

Thousands Saved By Well-Oiled Gears At Eskom's Matla Power Plant

An intensive energy saving study conducted by Eskom and Castrol engineers at one of Eskom's power stations, concluded that an annual energy saving of R377 000 can be obtained by merely converting the oil used in the mill's gearbox to a fit-for-purpose synthetic lubricant.

The study was conducted as part of an energy efficiency campaign in which gearbox lubrication was identified as a key area for potential savings. It found that by changing to a synthetic lubricant designed for gearboxes, 115MWh could be saved.

The testing was done in the wake of worldwide efforts to improve efficiency and cut energy consumption due to increasing energy prices as well as supply and demand constraints.

Comparative testing was done on the main mill gearbox at the Matla Power Station in Mpumalanga near Secunda. Eskom currently operates 12 coal-fired power stations and rolling out the Matla example could potentially save the organisation millions of rands annually.

The study, which included a series of tests conducted over a period of two weeks on the same mill, measured energy consumption from the switchgear room and the heat generated in the gearbox. Mervin Reddy, BP Africa Technical Services Manager, says the study, which was done using different validation techniques, found that an average return on investment of 439% was achieved by using its high performance synthetic gear oil, Optigear TM Synthetic X220.

"We were delighted with the results which are similar to those conducted on other test sites around the world. By switching oils we were able to record a 3.4% saving in the net power used, which is a great proof point of our synthetic oil's effectiveness."

He said the evaluation was initiated by a joint team of representatives from the plant and oversight was provided and data ratified by Leslie Barker, Eskom Chief's Engineering Technologist and Castrol.

"Major strides had been made in the development of high performance synthetic oils and Castrol remains at the forefront of this research and development globally."

"The latest oils have the potential to increase gearbox efficiency by providing excellent lubrication due to their structured hydrocarbons, prolonged oxidation resistance, high temperature stability and low evaporation rate. They also have high load carrying capacity, superior micro pitting protection, excellent friction reduction and good filtration properties."

WATTSUP

Lethabo Power Station Engineering Expo

From left: Anisa Nanabhay (SAIMechE), Elsie Pule (Eskom), Refilwe Buthelezi (Eskom, Power and Energy Section Chairperson), Dr Pat Naidoo (President SAIEE), Cilia Mpephu (Chairperson SAIMechE, Vaal Branch), Tumiso Railo (Eskom, Power and Energy Section) and Kelello Sammering (Eskom).

Visting group from Eskom Lethabo Power Station, SAIEE and SAIMechE.

Lethabo Engineering Expo was held on the 27th June 2014 at Lethabo power station situated in the Vaal region. The main objectives of the expo were to bring the voluntary associations closer to the professionals that they serve and to provide them with opportunities to renew their networks. Different voluntary associations were invited to present the work conducted within their association.

SAIEE President Dr. Pat Naidoo shared his vision of 'engineering electrical engineers for a world class South Africa'. He emphasied the need for engineers to work in teams in order to promote the collection of skills and experience as well as the opportunity to train, develop and empower our engineers. Chairperson of SAIMechE Vaal Branch Cilliia Mphephu reached out to the mechanical engineering professionals. In her presentation she highlighted the work that is being done by the branch and extended an invitation to be part of the association.

Amongst the panel of dignitaries were Eskom's Executive managers Vusi Mboweni, Elsie Pule, Shireen Prince and Prudence Madiba. Vusi Mboweni shared a presentation on the sustainability strategy for Generation and encouraged engineers, technologist and technicians to keep abreast with technology advancements. Elsie Pule explained the Eskom Women Advancement Programme which aims to address issues that hinder women in advancing into critical leadership and technical positions within the organization. Shireen Prince, a former Lethabo Power Station manager, shared some of the challenges and/or opportunities she experienced as a woman in Engineering. She encouraged all engineers to ensure that they obtain as much experience prior to assuming positions in management. Prudence Madiba, a member of SAIEE, represented the Power and Energy Section on that day. She explained the structure, benefits and mandate of the Section and invited fellow SAIEE members to get involved.

The expo was made possible by the support provided by Thomas Conradie (Power Station Manager) and Harry Sewsunker (Engineering Manager) of the power station.

RiCHARGE PROVIDES AFRICA WITH PUBLIC CELLPHONE CHARGING SOLUTIONS

As Africa's leading manufacturer and supplier of mobile charging solutions, RiCharge has announced its newest product, the Super Station, set to become the ultimate tablet and smartphone charging solution in Africa. Currently exporting to 12 international countries, RiCharge's latest offering is set to achieve their goal of keeping everybody connected, all the time.

RiCharge was founded by Janine Regtien thanks to her passion for events and development of new products in the African market. RiCharge has become the first company in Africa to design, manufacture and distribute public charging stations and solutions in RSA.

The RiCharge Super Station is the ultimate charging solution, charging up to 12 devices simultaneously with each drawer coming equipped with built-in charging tips, capable of charging any device. *"With its compact stylish design and super-fast charging, your device isn't compromised and you are able to charge right at your desk, in your pocket or your handbag. The Super Station has become the perfect charging solution for schools, universities, hotels, restaurants, hospitals, bars and gyms,"* adds Regtien.

The RiCharge Super Station is available to hire. This is ideal for events as it will attract feet, encourage guests to stay longer, provide safety for guests' devices and generate income, with the renting out of bays.

Other RiCharge products include their Solar Charging Umbrella. Table Top Chargers and their Pocket Chargers.

For more information on RiCharge, you can visit www.richarge.co.za

EMPLOYING RIGHT SKILLS KEY TO ADDRESSING INFRASTRUCTURE SPEND PROBLEM

A recent PPS survey conducted among approximately 600 South African engineers revealed a concerning average confidence level of just 40% when respondents were asked whether they felt government was effectively delivering on its promised infrastructure spend.

Key to addressing this concern is to employ the services of highly experienced engineers at a Government level to ensure the necessary roll out of infrastructure spend, says Manglin Pillay, Chief Executive Officer of the South African Institution of Civil Engineering (SAICE). *"Before Government spends money on projects, they should first look to populate its staff with experienced personnel who would be able to identify the correct way to distribute infrastructure spend. This is particularly important in the infrastructure departments where engineers have to deal with inappropriately qualified persons with insufficient experience when discussing tenders."*

Gerhard Joubert, Head of Group Marketing and Stakeholder Relations at PPS, the financial services provider focused on graduate professionals, says the survey results also point to concerns among engineers about the adequate training of young engineers. When asked whether they believe that the current engineering degree is training students sufficiently, 58% of respondents said yes. *"This is particularly concerning considering the findings of the Manpower SA ninth annual Talent Shortage Survey which revealed that engineers are the second most difficult job to fill followed by the trade sector. This means that the necessary skills to fill the vacant posts are simply not available, pointing to a problem at an education level for not training and mentoring the young graduates properly,"* says Joubert.

Schneider Electric and Conlog received anti-corruption certificate

The Certification Committee of ETHIC Intelligence, a leading international certification agency specialising in anti-corruption compliance programmes, has awarded Schneider Electric South Africa and Conlog, a Schneider Electric subsidiary, an Anti-corruption Compliance System Certification for its programme to prevent corruption.

The main conclusions drawn during May 2014, following an on-site ethics audit in February of that year by leading inspection, verification, testing and certification company, SGS, at both the energy specialist's head office in Midrand and at Conlog in Durban, revealed that Schneider Electric's compliance policy and governance model is well designed, formulated in a coherent manner and corresponds to international best practices.

The Schneider Electric Responsibility & Ethics Dynamics Programme, a fundamental of the governance model, is in itself proclaimed a best practice. The programme provides a common reference, a connected organisation and shared processes and tools as a support structure for employees to comply with the global organisation's "Principles of Responsibility". These principles are based on the major values to which Schneider Electric worldwide subscribes: Global Compact, Organisation for Economic Cooperation and Development, Human Rights, and the International Labour Organisation.

Although both Conlog and Schneider Electric are private companies, they have strong local and international board representation, which includes executive and non-executive directors, who lay the foundation for fundamental ethic intelligence. The board appoints the social and ethics committee, which is responsible for managing, monitoring and mobilising commitment to corporate governance in the company.

According to Eric Legér, country president for Schneider Electric in Southern Africa, the local governance model is formulated into an all-encompassing governance framework, incorporating both qualitative and quantitative governance. *"The model's qualitative governance consists of three main elements: intellectual honesty supported by the King III code on corporate governance, Schneider Electric's Principles of Responsibility (PoRs), and the fundamentals of ethical business practice,"* he says.

"Schneider Electric South Africa has a zero tolerance approach to unethical behaviour, and the company views its governance model as a winning approach for improving business conduct, leading to better growth opportunities in Africa and greater employee productivity. So far it has proven to be invaluable, and we are pleased to have now been officially awarded for our efforts," adds Legér. *"Schneider Electric insists on the importance of responsibility and its place at the core of our corporate governance."*

Master Power's R&D Dept - Power innovation a necessity for South African business

Eskom recently announced that it might reintroduce load shedding as South Africa is experiencing winter. Apart from the inconvenience factor of having no electricity, businesses may have to face the fact that for a few hours each day their staff will be sitting idle and their revenue generating activities will come to a standstill.

To prevent this power management solutions that allow business to continue, no matter what, are essential. Master Power Technologies manufactures power solutions to ensure businesses are not impaired by power outages or an inconsistent power supply.

In a competitive market where local and international companies are vying for power-related business, however, simply manufacturing UPS's, generators and supporting products does not guarantee happy customers. To ensure it remains at the forefront of power management solutions, Master Power Technologies launched its research and development (R&D) department four years ago.

Headed by Ruan du Toit, the R&D Department is responsible for ensuring Master Power's products and services remain at the forefront of power management on the continent. Today there are six skilled engineers working full time in the R&D department, creating innovative hardware and software solutions.

The department's first goal was to develop Master Power's testing centre. The testing centre was built to ensure the company's UPS's met IEC (International Electrotechnical Commission) standards. Du Toit explains that the tests are fully automated to ensure consistency and accuracy every time.

The R&D department then went on to develop Master Power's Universal Controller (UC), both the hardware and software. The UC's primary function was to ensure a reliable changeover between utility power and generators.

"It is critical to manage the changeover reliably and repeatable to maintain a stable power supply to the whole facility/datacentre to eliminate data loss or equipment damage," says Du Toit.

The UC was then expanded to include Building Management System (BMS) functionality, which constantly monitors the status of electrical equipment, such as fire alarms and panels, batteries, generators, HVAC (heating, ventilation, and air conditioning) and more.

Today, multiple clients' equipment is monitored and reports are sent to a remote site to provide a constant overview of the status of their systems and warn of impending or existing failures.

"We then extended this to produce our Battery Module Management System (BMMS)," says Du Toit. *"This allows clients and Master Power to continually monitor the status and health of batteries and manage corrective actions if needed."*

"We are able to tell if a single battery or a string of batteries are failing well before the situation turns into an emergency. More importantly, by identifying and replacing a single failing battery, we can extend the life of the UPS battery significantly."

On the software side, the R&D department has developed an Android tablet app that allows for the management of the UC.

In keeping with the company's sustainability commitment, the R&D department is in the process of developing a solution that will monitor solar panels to ensure they perform optimally. The testing centre will be expanded to include generator testing in the near future.

"The R&D department boasts a range of engineering skills that allow us to design and develop both hardware and software innovations that provide our clients with better control over their power management systems," notes Du Toit. *"Effective monitoring and management means a longer system life, and greater system reliability which means more value for the customer and an increased return on investment (ROI)."*

Molex Launches New Customised POF Cable Assemblies and Harnesses

Molex Incorporated has recently launched its new fully customisable Plastic Optical Fibre (POF) assemblies and harnesses designed to offer a rugged and cost-effective solution to provide maximum flexibility for optical cabling in a vast number of industrial, medical, transportation, renewable energy, smart grid, electrical & hybrid vehicles, consumer, sensors and imaging applications.

"Customers are able to specify assemblies and harnesses in terms of connector types, jacket material and colour, temperature range, UL certification, cable lengths and tolerances, numerical aperture, fiber size" says Mickaël Marie, European business manager, integrated products division, fibre optic business unit, Molex. *"Cable assemblies and harnesses terminated by Molex SMI connectors, plus a wide range of connectors from different manufacturers, are also available to answer specific application requirements at a cost-competitive price."*

Molex's POF cable assemblies and harnesses can withstand harsh environments in temperatures ranging from -55 up to +105°C. In addition, a choice of polymer and metal connectors from a wide range of manufacturers offers excellent Insertion Loss performance, through cost-effective component selection. The colour-coded cable jackets allow engineers to simplify connectorisation in the field or at factory floor, and the bare-fibre assembly capabilities make Molex's POF cable assemblies and harnesses an ideal solution for sensor applications. *"Purchasing fully-customised cable solutions can allow customers to simplify their supply-chain through vendor reduction and remove third-party costs,"* adds Marie.

Using Sand to Improve Battery Performance

Researchers develop low cost, environmentally friendly way to produce sand-based lithium ion batteries that outperform standard by three times

Researchers at the University of California, Riverside's Bourns College of Engineering have created a lithium ion battery that outperforms the current industry standard by three times. The key material: sand. Yes, sand.

"This is the holy grail – a low cost, non-toxic, environmentally friendly way to produce high performance lithium ion battery anodes," said Zachary Favors, a graduate student working with Cengiz and Mihri Ozkan, both engineering professors at UC Riverside.

The idea came to Favors six months ago. He was relaxing on the beach after surfing in San Clemente, Calif. when he picked up some sand, took a close look at it and saw it was made up primarily of quartz, or silicon dioxide.

His research is centered on building better lithium ion batteries, primarily for personal electronics and electric vehicles. He is focused on the anode, or negative side of the battery.

Graphite is the current standard material for the anode, but as electronics have become more powerful graphite's ability to be improved has been virtually tapped out.

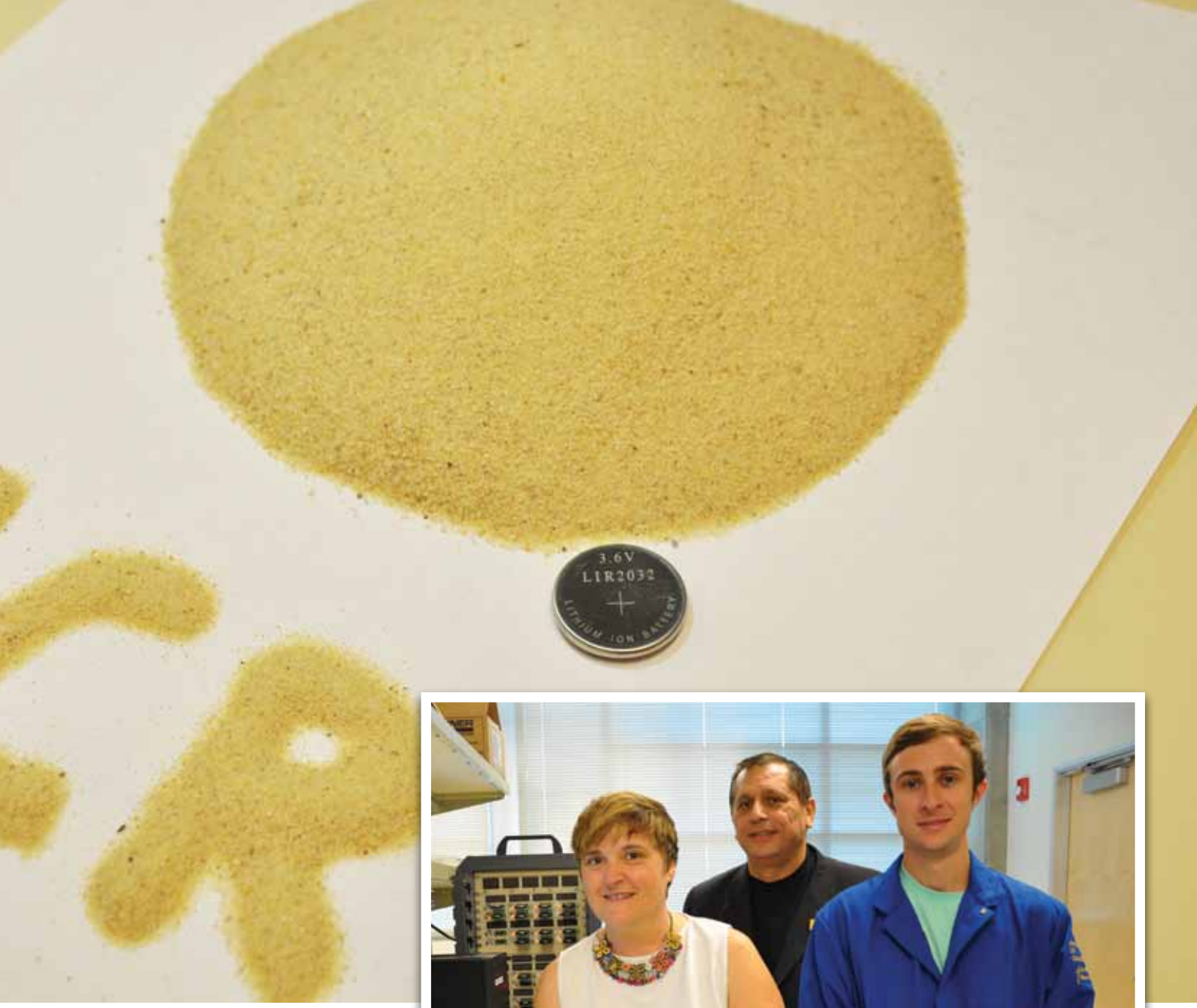
Researchers are now focused on using silicon at the nanoscale, or billionths of a meter, level as a replacement for graphite. The problem with nanoscale silicon is that it degrades quickly and is hard to produce in large quantities.

Favors set out to solve both these problems. He researched sand to find a spot in the United States where it is found with a high percentage of quartz. That took him to the Cedar Creek Reservoir, east of Dallas, where he grew up.

Sand in hand, he came back to the lab at UC Riverside and milled it down to the nanometer scale, followed by a series of purification steps changing its color from brown to bright white, similar in color and texture to powdered sugar.

After that, he ground salt and magnesium, both very common elements found dissolved in sea water into the purified quartz. The resulting powder was then heated. With the salt acting as a heat absorber, the magnesium worked to remove the oxygen from the quartz, resulting in pure silicon.

The Ozkan team was pleased with how the process went. And they also encountered an added positive surprise. The pure nano-silicon



From left, Mihrimah Ozkan, Cengiz Ozkan and Zachary Favors in the Ozkan's lab.

formed in a very porous 3-D silicon sponge like consistency. That porosity has proved to be the key to improving the performance of the batteries built with the nano-silicon.

The improved performance could mean increasing the expected lifespan of silicon based electric vehicle batteries up to three times or more, which would be significant for consumers, considering replacement batteries cost thousands of dollars. The energy density is more than three times higher than that of traditional graphite based anodes, which means cell phones and tablets could last three times longer between charges.

The findings were given in a paper, which will be published in the September issue of **watt**now magazine. wn

The prize will recognize four projects: three projects with grants of 10,000 EUR, 15,000 EUR and 25,000 EUR, and a new special prize of 10,000 EUR.

Orange launched the 4th edition of the Orange African Social Venture Prize

Following on from the success of the past three years, Orange launched the 2014 edition of the Orange African Social Venture Prize. A new category has been introduced for the fourth edition: the *"Orange Partner"* award will recognize the best project that integrates an Orange application.

- **Encouraging innovation and the use of ICT for development**

  The Orange African Social Venture Prize once again rewards entrepreneurs developing products or services that use ICT in an innovative way to meet the needs of Africans in fields such as health, agriculture, education, energy, industry or trade.

  Over the past three years, more than 1,500 projects have been submitted for the Orange African Social Venture Prize reflecting the dynamism of African entrepreneurs and the potential of the telecommunications sector.

- **Supporting social entrepreneurship to accelerate development in Africa**

  Operating in 18 countries in Africa, Orange serves close to 100 million customers. Given the impact that digital services can have on peoples' daily lives, this presence means that the Group plays an important role in the continent's economy and its future development. As a result, one of Orange's main priorities is to improve connectivity, particularly in rural areas, and to introduce innovative mobile-based services.

  To achieve this, the Group supports entrepreneurs, small and middle-sized firms by facilitating access to finance, supporting structures for incubation and giving access to tools for digital development. Since 2010, Orange is a partner of the CTIC Dakar incubator, a reference in Western Africa in terms of ICT development. In April 2014, the CIPME Niger incubator, initiated by Orange, opened its doors to start-ups in the fields of ICT, renewable energy and the environment.

- **The 2014 edition of the Orange African Social Venture Prize evolves with a special "Orange Partner" prize**

  The prize will recognize four projects: three projects with grants of 10,000 EUR, 15,000 EUR and 25,000 EUR, and a new special prize of 10,000 EUR will be awarded to the finalist who presents a project using an Orange API.

  In addition, the four winners will benefit from a six-month support package from entrepreneurship and ICT experts and, the first prize will be offered a patent submission in the country of the project's deployment.

  Once again this year, internet users can vote online for their favorite project on Orange's entertainment portal in Africa, http://www.starafrica.com. The winner of the "favorite project" will have its project submitted to the jury along with the others finalists shortlisted by the experts and will therefore have the maximum possible chance of being among the top four winners for 2014.

- **Who can enter?**

  Any entrepreneur (aged 21 or over) or legal entity that has been in existence for fewer than three years at the time of the competition may participate at no cost and with no restriction on nationality. Submitted projects must be designed to be deployed in at least one of the African countries in which Orange operates and must use information and communications technology in an innovative way to help improve the living conditions of the populations in these countries. wn

Applications are accepted until 19 September 2014 on Orange's pan-African web portal, www.starafrica.com.

Altaaqa Global opens office in Southern Africa

The new Johannesburg office will serve as a hub for Altaaqa Global's sales and operations in the Southern African region.

Altaaqa Global CAT Rental Power, a global provider of temporary power solutions, has recently opened a new branch in Johannesburg that will cater to several countries in Southern Africa, including the Republic of South Africa, Angola, Botswana, Mozambique, Madagascar, Malawi, Namibia, Zambia and Zimbabwe.

Altaaqa Global will bring its expertise, innovative technologies, industry-proven reliability and rapid deployment to the region, which is largely known for its thriving oil and gas, industrial manufacturing, and mineral and coal mining industries. Peter den Boogert, General Manager of Altaaqa Global, said that we would provide Southern Africa with the most advanced power plant packaged systems, remote monitoring, and fuel-efficient gas, diesel or dual-fuel-powered generators. *"Altaaqa Global and its sister company in Saudi Arabia have a total combined fleet of 1,400 MW rental power plant generation readily available to serve the Southern African region."*

One of the flagship innovations that Altaaqa Global will offer, he added, was the flexible operational mode that can switch from island to grid mode in just seconds. Furthermore, Altaaqa Global's energy rental dynamic package allows its power plants to hook directly to the grid without the need for a substation.

The global outlook for the rental power industry has been encouraging, and Steven Meyrick, Board

Representative of Altaaqa Global, sees merit in capitalizing on it through strategic market and geographic expansion. *"With this recent feat, we believe that we are on our way to fulfilling, even exceeding, the highly ambitious objectives we set at the launch of our company in 2012."* Meyrick added that Altaaqa Global would continue to pursue multi-megawatt independent power projects (IPP) in various industries, in addition to heavily investing in human resources, process and business optimization, and product expansion.

In line with its avowed corporate social responsibility programs that aim to alleviate the social needs of its immediate environs, Altaaqa Global will also continue to provide job opportunities, extend immediate assistance for school children, and conduct educational campaigns on energy conservation and environmental stewardship in Southern Africa. Meyrick continued, *"One of the pillars of our sustainable business model is employing and training local professionals in areas where we operate, and we are excited to extend that commitment to Southern Africa."*

Majid Zahid, Strategic Accounts Director of Altaaqa Global, said, *"Southern Africa has a promising economic outlook within the energy, engineering, production, oil and gas, and mining sectors, and we are delighted to open our new office in Africa to provide our wide range of highly innovative interim power plants. We are determined to serve various industries, such as oil and gas, petrochemicals, mining, electric power utilities, industrial manufacturing and maritime."*

Altaaqa Global has been aggressively making inroads into the African market with the opening of branch offices in several key locations in the continent. *"We have also recently opened an office in East Africa,"* said Den Boogert, *"and have appointed a highly competent management team to oversee our African operations."*

He shared the information that Hendrick Mtemeri, a power distribution veteran with more than 20 years of experience in the power utility industry, has been appointed as the Regional Director for the entire Sub-Saharan region, and Paul Heyns, a power equipment engineering expert based in Pretoria, and Oduor Omolo, power generation professional based in Nairobi, have been appointed as Sales Managers for Southern Africa and East Africa, respectively. *"Under their leadership, we will reinforce our presence in Africa and ensure that we stay close with our customers."*

The economy of Southern Africa is largely driven by the precious stone, mineral and coal mining industry. The Republic of South Africa, a leading economy in the Southern African region, is ranked as an upper-middle income economy by the World Bank, and is touted to be the largest African economy ahead of Nigeria. Though still reeling from the effects of its recent economic setbacks, the African Economic Outlook expects South Africa's economy to moderately accelerate in 2014.

Angola's economy, after experiencing slow growth due to the recent oil and financial crises, is also predicted to be on the rebound, expected to grow by 7.8% in 2014. Furthermore, Mozambique's economy is forecast to maintain its upward trend, predicted to grow by 8% in 2014. Agriculture, manufacturing, oil and gas, in addition to mineral and coal mining, significantly contribute to the countries' GDP, as well as to their employment rates. wn

Transforming Construction

Leading electrical construction company, EnI Electrical has committed to a long term vision of changing the way in which electrical construction work is conducted.

To achieve this, the company is repositioning itself by applying the same principles its holding company the Zest WEG Group has harnessed to achieve its own extensive growth and success.

"It is our intention to become the largest electrical construction company in Africa," Trevor Naudé, managing director of EnI Electrical, says. "This is in line with the greater WEG Group's global growth strategy, which is expected to ensure that the entire organisation increases its sales by at least 17% year on year until 2020, when it aims to arrive at a turnover of US$10-billion.

"We're cognisant of the ever-changing needs of our market, as well as the shifting dynamics of our clients' requirements. Our response is to challenge the market's perception of electrical construction as a sector characterised by low tender pricing and utilising scope changes to be profitable. Instead, we've adopted a strategy based on forming long term client relationships. This is not a catch-phrase — we are actually walking the talk by ensuring we understand the basic project requirements and mitigating against scope changes during the initial pricing stage."

Naudé says that over the past three decades EnI Electrical has established a solid track record of successful completion of electrical construction projects. Since the Zest WEG Group acquired the company in 2008, processes and procedures have been developed to take this successful medium sized company to the level where it will be acknowledged as a world class player.

"This is particularly significant given that much of the work being done is in Africa, with some 70% of the company's revenue being generated outside of South Africa's borders," he adds. "Operating in Africa requires a certain mindset and it's essential for companies to clearly understand the factors that drive successful project execution in this region, including the issues associated with logistics. Our access to a core of South Africans with the necessary skill sets is a major advantage, as these teams are then able to train and develop local communities, leaving them skilled and capable of supporting the client in our absence."

EnI Electrical has completed projects as far afield as Mali, Burkina Faso and Ghana in West Africa and Tanzania in East Africa, as well as throughout the SADC region. With successful operations in Ghana, Zambia, Tanzania and Mozambique, the company is now poised to open facilities in Liberia and Namibia. These will support recently awarded contracts for the Western Range Iron Project in Liberia and the Husab Project in Swakopmund. The new entities are being locally registered and will provide employment opportunities.

Cabling and racking underway on an EnI Electrical project.

The increased emphasis on safety throughout all industries has made compliance with safety requirements a basic necessity. Naudé believes safety goes much further than simply meeting legislative requirements and, by making it the cornerstone of the company EnI Electrical has forged a robust safety track record across all operational sites.

Risk assessments are undertaken on each project and dedicated safety officers, supported by an in-house safety manager, take responsibility for safety on site. Ongoing safety training company-wide ensures that personnel are kept abreast of the latest technology, applications and safety requirements. Environmental obligations are also high priority and care is taken to meet all requisites.

In South Africa, EnI Electrical recently opened a branch in Rustenburg to provide electrical construction expertise on both small and large scale projects in the region. The new facility shares premises with the Zest WEG Group's facility in the city. wn

"It is our intention to become the largest electrical construction company in Africa," Trevor Naudé, managing director of EnI Electrical, says.

Another 40 MW solar plant completed in South Africa

Scatec Solar, the integrated independent solar power producer, has started commercial operations of a 40 MW solar PV plant in South Africa, increasing its installed capacity in the country to 115 MW. The Linde project, located in the Northern Cape region, is the second utility scale solar PV plant Scatec Solar has completed under the South African Renewable Energy Independent Power Producer Program and the first of its two projects awarded in the second round.

The completion of the Linde project coincided with the announcement that South Africa has now connected more than half a gigawatt of utility-scale solar power, ranking it amongst the world's top 10 of countries harnessing renewable energy from the sun, according to figures released by Wiki-Solar.org.

"The completion of the Linde project is a milestone that confirms Scatec Solar's strong position as an integrated independent power producer", said Raymond Carlsen, CEO of Scatec Solar. He added *"I am very pleased with my team and partners who have been able to realize this complex project on time and on budget. We have built on the experience gained from our Kalkbult project, and have broadened this with our first installation of a solar tracker system which will increase the output from the plant considerably. Scatec Solar has for more than four years been actively developing project opportunities in South Africa, and we look forward to realize more projects for the benefit of the regions and the local communities in which we operate"*.

As was the case with Scatec Solar's first South African project, the 75 MW Kalkbult plant, the Linde project has been developed by Scatec Solar through its South African joint-venture company Scatec Solar SA. The plant is located at Linde near Hanover in the Northern Cape, a sun drenched region that boasts some of the best conditions for solar power anywhere in the world. The annual production will be approximately 94million kWh per year, enough to cover the electricity demand of about 20 000 South African households. The power will be fed into the local grid and sold through a 20-year Power Purchase Agreement with the national utility company, Eskom. Harvesting solar power through this plant represents CO_2 abatements of almost 80 000 tons per year.

The project is financed through South Africa's largest commercial bank, Standard Bank and the consortium providing the equity finance consists of Scatec Solar as the largest majority owner, Standard Bank, Old Mutual Life Assurance Company, Norfund and Simacel.

The local value creation of the project is substantial. The construction of the plant has provided significant local job opportunities in addition to utilizing local content to stimulate the nascent South African renewable industry. At Linde, Scatec Solar and sub-contractors have recruited and trained more than 350 employees at different levels ranging from technical skills to finance and project management. In peak periods, more than 340 employees - the majority from the local community - were working at the construction site.

A portion of the revenue from the plant as well as the project dividends will be earmarked Socio Economic Development initiatives in the area around the project site. The primary focus will be on skills development, educational and health initiatives. wn

Earn CPD Credits

"Getting on" and "getting by" underground

This paper examines the gold miners' informal working practice of making a plan (planisa) at the point of production deep down the mine.

BY | SIZWE TIMOTHY PHAKATHI | PhD (DPhil)
CHAMBER OF MINES OF SOUTH AFRICA

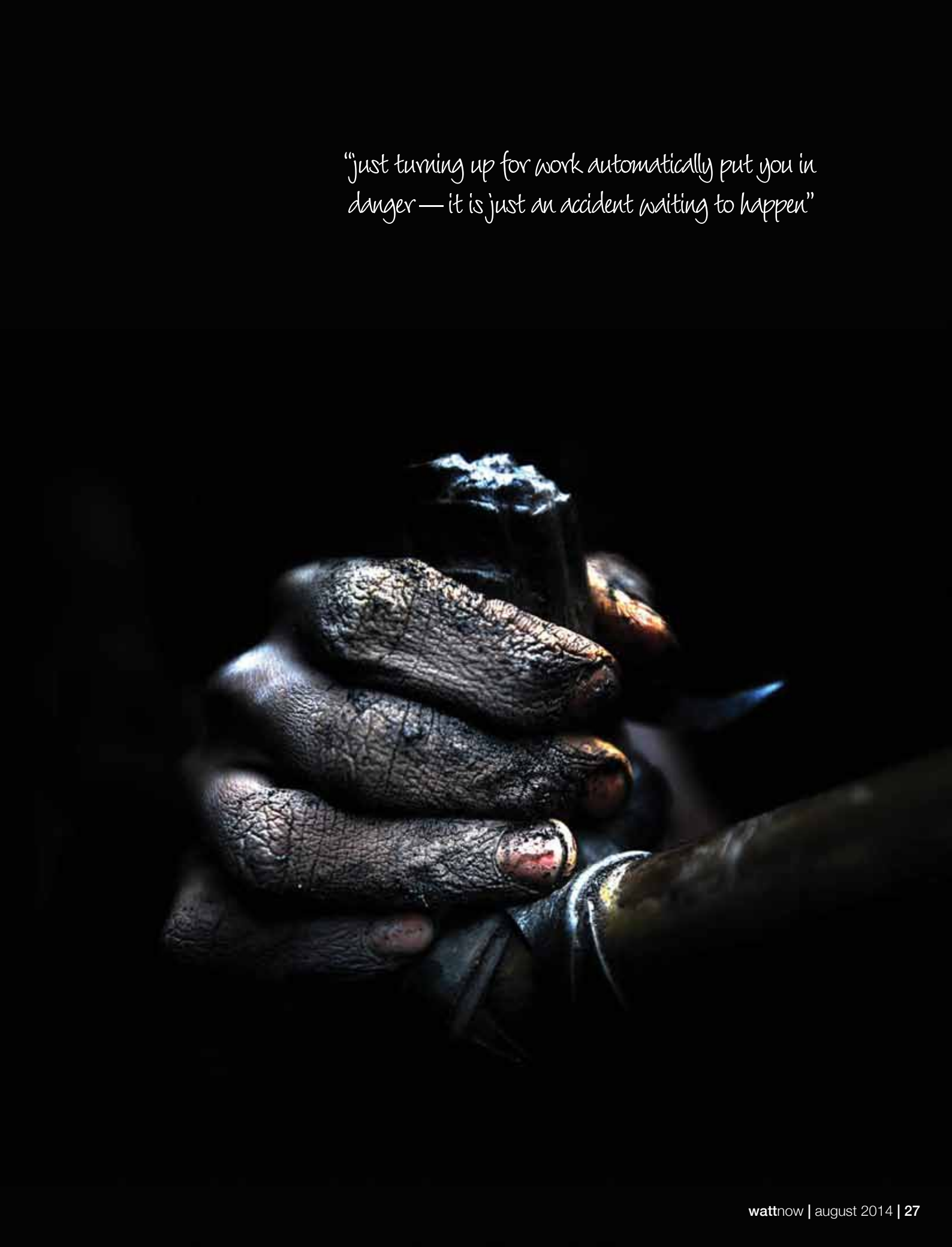
Planisa is a Fanakalo (mining lingua franca) injunction, entreating miners to deploy their skills and ingenuity to tackle the day-to-day problems posed by the endemic uncertainties and organisational dysfunctions of mining. The miners' informal working practice of planisa suggests that management's formal or standardised work methods (rules and regulations) are not always efficient in complex work situations. Making a plan inside the pit indicates that the gold miners are creative beings capable of maintaining control over their working day (Blauner, 1964).

The specificity of ultra-deep mining – depth, heat, fall of rocks, rockbursts and seismic events – represents a unique, artificially created, total work environment. Workers learn to deal with the complexity of uncertainties that characterise this environment and it is out of this scenario that their occupational culture is born. Workers are required to "read" and anticipate changing conditions in the immediate geological environment, work safely in order to survive while responding to production demands.

Under these mining conditions, workers tend to face blockages that impinge upon their day-to-day work life. The combination of factors compels underground workers to make a plan (planisa) or improvise the production process either as a result of an instruction or out of the work team's self-initiated action. In other words, they "get on and get by" underground in order to cope with these organisational constraints and inefficiencies.

Unlike in a factory where the degree of control is much wider for the worker to perform work to prescription, mining remains an inherently dangerous operation despite contemporary technological and behavioural innovations geared at improving the safety and productivity of mining operations. Mineworkers confessed to Sommerville (2005, p. 13) at CoalCo Mining Company that *"just turning up for work automatically put you in danger – it is just an accident waiting to happen"*. In a hostile environment such as underground mining, relying solely on formalised work procedures may not be adequate to ensure

"just turning up for work automatically put you in danger — it is just an accident waiting to happen"



"Getting on" and "getting by" underground

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the safety and productivity of miners. Owing to a variety of organisational and geological factors beyond their control, miners tend to develop informal strategies to deal with the deficiencies of formalised procedures to ensure their own safety and restoration of production (Fitzpatrick, 1980; Gouldner, 1954; Kamoche and Maguire, 2010; Sommerville, 2005; Trist and Bamforth, 1951). Important to note though, as will be argued later, the very same informal work practices the miners engage in may backfire to the detriment of worker safety.

A number of labour process studies have shown the interaction between formal (official) and informal (unofficial) work arrangements. Workers do not always achieve production goals through formal work strategies. Where formal or bureaucratised work methods fail to overcome production bottlenecks, shop-floor workers bypass work standards and adopt informal work strategies in order to maintain control over the production process. This then raises questions about the efficiency of formal or bureaucratic methods of work organisation in certain work situations (Gouldner, 1954; Kanigel, 1997; Merton, 1949; Roethlisberger and Dickinson, 1952, 1984).

The extant literature on the informal organisation of work has paid little attention on the impact of informal working practices on workplace safety especially in underground mining operations where danger is eminent. Much of the attention has been on the manner in which workers fiddle workplace rules in order to resist or consent to production goals in ways that make sense to them (Allsop and Calveley, 2009; Bolton and Houlihan, 2009; Burawoy, 1979; Collinson and Ackroyd, 2005; Lupton, 1963).

What is missing though, as this paper will show, is the politics of safety particularly when workers' engagement in unofficial working practices culminates in worker injuries and accidents. Hopkins (1984) and Nichols (1997) work has tackled the subject of worker safety in the context of managerial and organisational dysfunctions to highlight the factors that compel workers to violate production and safety procedures.

Much more workplace-based studies are needed if we are to fully understand the pros and cons of informal workplace practices in workplace safety and workplace productivity – especially in an era where many capitalist organisations are under pressure to realise profits. Such studies will enhance our understanding of the impact that the changing nature of work has had on workplace safety and productivity, especially in high-risk organisations such as underground gold mining.

This paper seeks to make a contribution to the existing body of research through the examination of the gold miners' informal working practice of making a plan (planisa) and its implications for the day-to-day organisation of production and worker safety in a post-apartheid deep-level gold mining workplace. The paper is divided into seven sections including the presiding first section.

RESEARCH METHODOLOGY

To understand the gold-miners' day-to-day lived and subjective experiences of the mining labour process and their responses to work reorganisation, I immersed myself in the daily working lives of mineworkers for an extended period of time at GoldCo – a pseudonym of a deep-level gold mines situated approximately 150 kilometres southwest of Johannesburg. The research was ethnographic in nature and the participant observation was the main research technique used in the field. According to Hammersley and Atkinson (1995, pp. 1-2): *Ethnography involves the ethnographer participating, overtly or covertly, in people's daily lives for an extended period of time, watching what happens, listening to what is said, asking questions – in fact, collecting whatever data are available to throw light on the issues that are the focus of the research.*

I adopted the role of participant observer (Burgess, 1984; McCall and Simmons, 1969; McNeill, 1990), living with mineworkers in the mine hostel, participating in their production tasks and observing the manner in which they performed those tasks inside the pit. For six months[2], I spent nearly all my time in the mine hostel and inside the pit with teams of underground workers.

A typical gold mine consists of a number of production sections. Within each section there are a number of work teams or production gangs (that is, stope workers and their team leaders), foremen (shift-bosses) and middle managers (mine captains or mine overseers).

I first negotiated and gained access to the gold mine via the presentation I made to GoldCo executive management and union representatives at their Head Offices in Johannesburg. I was subsequently introduced to the management committee (comprising worker representatives) of the gold mine studied by a GoldCo staff

member based at Head Office. The mine captains were briefed about the study by Gert, the human resource manager. The mine captains introduced me to the shift-bosses (production supervisors) of the underground work teams studied[3]. The production supervisors introduced me to their production teams when I started my participant observation research inside the pit. I had already been introduced to the workers by the trade union at a mass meeting it had organised at the arena inside the mine hostel.

The underground teams studied were mining gold at depths of 2,000-2,500 metres below the surface. I went underground every morning with the underground work teams and, occasionally, with their shift-bosses. I ensured that the majority of the time was spent with the underground gold miners. Underground work teams varied greatly in their constitution and strength depending on the size of the stope. A stope is any excavation underground to remove ore (the gold-bearing rock). A full-strength stope team might comprise ten to 18 members with a team leader. Each team member would invariably perform the tasks of barring, drilling, backfilling, supporting (with timber or cement packs and pressurised elongates with headboards) and sweeping or removing the broken ore (gold-bearing rock), whether the worker was formally trained or not.

The production tasks I performed inside the pit entailed assisting team members in offloading production material such as timber packs from the locomotive and transporting the packs to the rock-face, installing rock support by means of timber packs and props, clearing travelling way (commonly known as housekeeping) to the rock-face and loading mud in the haulage stream into the hopper[4]. These production tasks were less dangerous and did not require much on-the-job knowledge and experience as compared to rock drilling. Underground mining in general is a highly regulated business, for safety and legal reasons.

Although I attended the mine's induction programme, I was not formally trained nor certified to perform any of the underground mining jobs. I was not an official mine employee. I had to bear this in mind during the course of the fieldwork. If something had happened to me, be it accident or injury, the mine would not have been held responsible. For this reason, I took life insurance cover as a precautionary measure for the entire duration of my fieldwork.

Underground, I held conversations or informal interviews with underground work teams (or stope workers) and their production supervisors (shift-bosses) on various issues relating to, among others, the formal and informal organisation of work, supervisory practices, management behaviour, occupational health and safety, production targets and production bonuses. Given the diversity of the culture of the workforce, as a researcher, I interacted and communicated with the informants in their choice of seven South African languages, namely English, isiZulu, isiXhosa, Sesotho, Setswana, Xitsonga and the mining workplace lingua franca, Fanakalo. Being a South African, I could speak and understood these languages including the mining pidgin of Fanakalo.

In the mine hostel, I shared a room with underground workers and ate with them at the hostel's communal kitchen. On certain afternoons and during weekends, I played football with the informants. I spent time with them in the pub drinking a soft drink or beer, playing pool and watching television. I also spent time in the mine's training and development centre where induction and training are given to mine employees. These interactions facilitated a dialogue and strengthened the rapport between the researcher and the researched. The role of observer-as-participant (Burgess, 1984) was employed when I attended various mine management meetings, shop stewards' and union mass meetings, organised weekly or monthly. These meetings supplemented data gleaned through my interactions with the rank-and-file employees and enabled me to understand the organisation of the mine from a managerial point of view. My interactions with mine supervisors, managers and union leaders tended to be brief and formal. As stated earlier, much of the time was spent underground and in the mine hostel with the work teams. This reassured the informants that I was not the "mine-bosses man" nor a "trade union man" but an ethnographer researching the mining labour process and the working lives of underground gold miners. The documentary data collected included wide ranging but relevant data from official documents, annual company reports, news briefs, production and safety statistics, workplace notice boards, newspapers and the internet. These data supplemented data collected through participant observation discussed above.

The data presented in the paper relate to the gold miners' informal working practice of making a plan (planisa) and the factors that triggered such a practice inside the pit. The method used to gather

"Getting on" and "getting by" underground

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the data presented in this paper indicates further the significance of ethnography in the discovery and understanding of the underlying social processes that shape the day-to-day organisation of work.

THE FIELD SITE

GoldCo commenced production in 1968 and for many years it had been one of the leading producers of the high-quality grade of ore on the Witwatersrand gold-bearing reef. The recent years have seen GoldCo's volume of gold production declining. In 1998, the mine's production was at a peak with some 1.08 million ounces and declined to 158,000 ounces in 2009. The declining levels of production at GoldCo resulted from the intersection of complex unexpected geological structures which limited mining flexibility and development of stope faces and rising working costs (GoldCo, 2007, 2008).

For a variety of reasons, the mine struggled to meet its production targets inspire introducing a bundle of new forms of work organisation including teamwork, production bonus schemes, employee involvement programmes and shop-floor supervision (MacDuffie, 1995). As Gert, the Human Resources Manager, admitted on my first day at the mine: *"... one of the things you need to do for us is, pray for us. We are currently not doing well in terms of gold production and costs ..."*.

Robert McHughes, the Mine Manager, echoed the same sentiments to the workforce in one of the mass meetings organised by management on the mine: *We need to keep our costs down for the gold we produce. Since 2001, gold production has gone down. From January to March 2007, we made a loss [y] The more gold we mine, the more money we get. We sell gold. That is our business.*

Unlike in other gold-producing countries such as Australia and Canada, in South Africa, gold mining is expensive because the ore deposit is located at ultra-deep levels. As a result, it is difficult and costly to insert appropriate technology to extract the gold- bearing rock. It is for this reason among others that South African gold mining is labour intensive.

MAKING A PLAN (PLANISA) INSIDE THE PIT

In the gold mine studied, it was found that in response to production bottlenecks at the rock-face, the stope workers bypassed work standards and adopted the informal or coping work practice of planisa (making a plan). The following organisational factors compelled underground gold miners to engage in the shop-floor tactic of making a plan:

- imposition of standards;
- budgetary constraints;
- material shortages and mechanical breakdowns;
- production pressure; and
- production bonuses.

IMPOSITION OF STANDARDS

Mine standards, rules and procedures have developed from both engineering specifications and designs as well as how these have been modified by past experience. As has already been shown in the previous section of this paper, adherence to these standards often conflicts with responses to uncertainties that workers are required to make as they manage their work to achieve production targets and increase their bonus earnings. Stope workers viewed planisa as part and parcel of gold mining – something which gold mining would not take place without. As Max, the team leader, remarked:
Every job entails the element of planisa. You cannot authorise someone to make a plan, but we do make a plan.

Risk taking under these conditions of multiple constraints becomes inevitable. Workers are then blamed in the event of injuries incurred when rules may have been breached in order to get the job done, not yet having institutionalised the de facto power of the right of refusal to work under dangerous conditions as promulgated by the mine health and safety legislation. In this sense, the past of the despotic workplace regime negatively intrudes on current attempts to introduce a new work culture for the creation of a healthy, safe and productive deep-level mining workplace. This has to some extent to do with the production pressures that the top managers of the mine studied were under, which left the responsibility of cutting corners with the miners themselves and their supervisors.

BUDGETARY CONSTRAINTS

Workers face the implications and consequences of the practice of planisa at higher levels within the organisation. As noted earlier, the informal work practice of making a plan takes place at worker and supervisor levels. Miners, shift-bosses and mine captains were also under pressure to produce not only in terms of meeting production targets but also in saving operating costs.

The pressure exerted by top management to supervisors does not apply only in a deep-level gold mining workplace. For example, Dalton (1992) discovered at Milo

that cost pressures compelled middle and lower officers to distort cost figures in order to impress top management and gain promotion.

Down the mine, in order to secure bonuses, mine captains must deliver their specified targets under budget, at the same time struggling against the costing department, which attempts to ensure that work is performed within the budgets allocated for planned routines. Mine supervisors (shift-bosses) are consequently reluctant to apply for extensions to their budgets.

Where stope workers sense dangerous or hazardous conditions and require additional materials, especially supports, the normal stresses of dealing with a hostile working environment are compounded by having to beg and plead for equipment to make a working area operationally safe.

As stated earlier, mine supervisors are under their own pressures as the costing department systematically pays 85 per cent of budget, thereby squeezing supervisors to make do with fewer materials and less equipment than they in fact need.

Workers at the rock-face end-up bearing the brunt of attempts at controlling the production costs under conditions of the fluctuating dollar price of gold and weakened Rand (South African currency) as mine management attempts to stay in business. The interest of shift-bosses and mine captains to get the job done was found to conflict with the costing department's concern to cut costs and ensure the profitability of the mine.

In response to cost pressures, budgetary constraints and material shortages, shift-bosses reinterpreted and made sense of top management's stringent or tight budgetary allocations (Balogun and Johnson, 2004; Conway and Monks, 2011; Turnbull, 2001) by making a plan among themselves. One day, Lee, the shift-boss, remarked to me while we were underground overseeing production: *You end up having to make a plan or steal material. We do also assist each other. For example, the other shift-boss asked me to loan him some money from my budget to buy material because he does not have the money in his budget. I loaned him R500 (about $70). I know he will help me with something in future.*

Jimmy, the shift-boss, concurred with Lee that they made a plan by taking calculated risks and shortcuts in response to production blockages: *I am not 100% within standard and would say it openly. And mining is a risky game. You are taking risks every single day [y] but there are risks you must be prepared to take and there are certain risks you must not be prepared to take. And I would say this openly to anyone. And with the support and safety of the person, that is the risk you can't take. And if they are willing to take that risk, they must be willing to take the repercussions that come with that risk, which are major repercussions.*

Jimmy's remarks show further that supervisors or people with authority also cut corners and bend workplace rules to ensure a workable system of production. In a nutshell, they engage in management misbehaviour (Ackroyd and Thompson, 1999; Deery et al., 2010).

MATERIAL SHORTAGES AND MECHANICAL BREAKDOWNS

Material shortages were a frequent blockage to production down the mine and adversely affected the capacity of stope workers to meet their production targets and earn their bonuses.

To offset the negative impact of material shortages on their production targets and bonus earnings, the stope workers made a plan by searching for material in every possible place underground, including the madala site (previously mined area that has been shut down). As Philemon, a rock-drill operator, commented: When there is no material *"... we look for material elsewhere or in the* madala *site so that we can blast. We make a plan. We take that risk...".*

For safety reasons, unauthorised entry to such an underground site is prohibited by law and is considered a hazardous act. Nonetheless, as the above-mentioned stope worker's remarks indicate, I observed stope workers going to the *madala* site to search for materials with which they could improvise.

The miners searched for a host of material including timber packs, unused props, bolts and nuts or pieces of wire with which to fix equipment such as winches. As Lefa, a winch operator, pointed out:
"We do run short of material for weeks or months."

Sylvester, a rock-drill operator, echoed the same sentiments: *"We do experience delays (in the delivery of materials). This can cost you a blast (production)".*

Mike, a stope team worker, had this to say: *"There is a problem with the material not being delivered on time ... especially (timber) packs for (rock) support. Drill sticks or* amajombolo *are always in short supply, spares and pinch bars are old."*

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I observed that stope workers went to the madala site to search for material they could use to improvise or restore production. Moreover, a lack of supplies led to theft and robbing of materials underground resulting in unsafe practices and non-adherence to formal work standards. As Petros, a stope worker, remarked: *"We (stope workers) do make a plan by stealing or searching for material from other sections and cross cuts..."*.

Themba, a winch operator, had this to say: *"We borrow the material from the neighbouring panels. Miners do it."*

In addition, breakdown of machinery was another blockage to production leading to shorter rock-face advance, unnecessary expenditure of effort and increased worker frustration at the rock-face. Installed fans, pumps and winches often required almost immediate replacement or fixing but it took longer than necessary to fix broken equipment. As one shift-boss pointed out: *"Things are not easy to do properly where the mono-winch is out of order for seven months and where there are only a few locos to transport people. But you regard these problems as temporary."*

Broken winches and shortages of winches prevented stope workers from removing the broken ore from the gully to the ore-bins and caused the broken ore to pile up in stopes and gullies. According to work standards, it is illegal not to remove the broken ore from the stopes and gullies because it leads to the reduction of the content of gold in the broken material.

This finding of material shortages and equipment failures that compelled the stope workers to resort to the unofficial or coping work strategy of making a plan is in line with Nichols' (1997) finding that mine management's failure to provide enough tools at the coalface was one of the factors that led Turkey's Zonguldak coal miners to engage in unofficial or "illegal" practices (e.g. shortcutting) which, of course, endangered their health and safety.

The following remark from one of the coal miners cited in Nichols (1997, p. 188) illustrates the point: *"We can't support the hanging wall safely because the props don't come on time. We don't have enough tools. To finish the job that I'm supposed to do I sometimes have to pinch things from somewhere else."*

PRODUCTION PRESSURE

The gold mine studied was – from the mine manager at the top to the stope worker at the bottom of the organisational hierarchy – under pressure to produce gold. However, the pressure of production was most felt by the stope worker excavating the gold-bearing rock. I observed that the pressure to meet production targets compelled stope workers to make a plan underground. As Danny, a winch operator, remarked: *"There is pressure on team leaders and miners to blast. They have double pressure (production and safety). We rather blast to protect them. If you refuse to work in an unsafe area, you are badmouthed and told that you have a bad attitude."*

Petros, one of the miners, echoed the same sentiments: *"Sometimes people are in a dilemma of ... that attitude of forcing people to work in an unsafe area. Following the law might work against you. It can affect your (performance) record because you put safety first. For the miner not to blast (the gold-bearing rock) for three days is a bad (performance) record. Five days without blasting is worse. As a miner, you should know that safety (law) can break your (performance) record. The mine can dismiss. So you are tempted to risk for the sake of boosting your (performance)record."*

Danny's and Petros' remarks suggest that the stope workers made a plan *(planisa)* not only for the purpose of meeting production and safety goals but also for *"watching out for each other"* against harsh managerial decisions – to protect their team leaders and miners from being punished by their shift-bosses and mine captains for turning low levels production. The stope workers were willing to make a plan to ensure that they and their team leaders appeared *"good workers"* (see Kamoche and Maguire, 2010) in the eyes of their bosses. In this context, making a plan inside the pit embodied an occupational culture and identity of brotherhood *(Gordon, 1977)*.

Contrary to Gordon's (1977) observation regarding the miner's tendency to use the covert strategy of brotherhood to restrict output, the gold miners whom I studied collectively employed the brotherhood tactic not to restrict output per se but as an adaptive, coping or defensive tactic *(Allsop and Calveley, 2009; Foner, 1993; Prasad and Prasad, 1998, 2000)* that they engaged in to expand rather than restrict output *(Kirchhoff and Karlsson, 2012)* in ways that shielded fellow workers from being punished and scolded by their bosses for failure to get a blast (production or broken ore). The team workers understood the harsh treatment their team leaders and miners were faced with if they failed to impress their superiors. This highlights the autonomy of gold miners by the manner in which they resented management control

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and maintained control over their working day.

In the eyes of the shift-bosses and mine captains, team leaders and miners who failed to improvise production through making a plan were incompetent. In this instance, making a plan was a response to managerial coercion. As David, a stope worker, remarked: *"Team leaders who stick to the law (by refusing to make a plan) are bad-named and changed from one gang to another. They are called 'they know too much'* (makhulu skop) *and do not want to listen. You are being intimidated, I will charge you. You must blast that panel at all cost."*

This was particularly the case in the apartheid mining regime. As the President of the NUM pointed out: *"In those days, if you went back and said you didn't want to drill in an area because it was bad, you were ridiculed and threatened. You were told to make a plan and were sent back* (Sunday Times, 2008)."

The miners, shift-bosses and mine captains were also under pressure to produce. Hence they tended to instruct their charges to make a plan to resolve blockages to production. This usually meant non-adherence to formal work standards and adoption of alternative informal work practices. As Kau, a rock-drill operator, pointed out: *"They (shift-bosses and mine captains) would tell you drill, tshaya and blast, tshisa. You will then make a plan to please them. If you do not, you would be asked so many questions as if they did not know that you did not have the necessary material and equipment."*

Petros, a stope worker, shared the same view: *"If you happened not to do it on another day, the shift-boss might ask you why you did not make a plan."*

The shift-bosses' and mine captains' interests in the miners' unofficial work practice of making a plan affirms the notion of the involvement of management in workplace fiddles (Ackroyd and Thompson, 1999; Richards, 2008).

PRODUCTION BONUSES

This section of the paper seeks to highlight the influence of the production bonus on the gold miners' informal coping strategy of making a plan. Watson (1980, p. 193) points out that *"a payment system devised by officials to increase output may invite unofficial strategies among work groups who choose to resist pressure to speed up their work ..."*. The desire to increase bonus earnings by all means perpetuated the work practice of planisa underground. Manolo, the winch operator, commented that to meet the production target and qualify for the bonus: *"Workers make a plan in order to blast and get a productivity bonus ...."*

Jay, a rock-drill operator, shared the same view: *"The miners and shift-bosses do make a plan in order to get the bonus."*

The miners and shift-bosses also improvised production through planisa because they, too, were paid bonuses when their crews achieved the production target. Hence they tended to instruct their charges to make a plan to resolve blockages to production.

As discussed earlier, this is best illustrated in the manner in which shift-bosses handled budgetary constraints. This usually meant non-adherence to formal work standards but adoption of alternative informal work practices such as planisa.

A DOUBLE-EDGED SWORD

The reality is that making a plan has pros and cons for stope workers down the mine. If they engaged in planisa, the stope workers bypassed formal work standards including their right to refuse to work in unsafe areas. As Billy, a rock-drill operator, commented: *"Planisa is about taking chances. It is out of mine standards."* Billy's view was shared by Alfred, winch operator: *"Planisa is not legal. Planisa is out of standards."*

Planisa was appealing to mine management only if it did not result in injuries and accidents. Shift-bosses and mine captains praised their charges. However, in the event of injury or accident, the stope workers were blamed by their bosses. The causes of occupational injuries and accidents are attributed or reduced to worker behaviour rather than to a variety of organisational, managerial and human factors pertaining to the labour process of gold mining. The "culture of blame" consequently persists as infringements of rules and regulations are met with institutionalised sanctioned penalisation.

In the gold mine studied, planisa constituted two sides of the same coin or a double-edged sword – admiration on the one side and condemnation on the other.

The words of Dave, a stope worker, emphasise the point: *"Making or trying a plan is good (only) when it does not result in accident. But if your plan was successful you are good men* (madoda). *You can make a plan* (planisa), *but once there is a mistake, you are in trouble."*

Workers' ability to make a plan at the rock-face entailed occupational prestige and affirmation of occupational and masculine

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identity, power and strength in doing a tough job, surviving and adapting to dangerous working conditions in deep-level mining *(Douglas and Krieger, 1983; Fitzpatrick, 1980; Iacuone, 2005; Yarrow, 1979, 1992)*. It can be argued that when miners make a plan in a positive manner – that is to say, if it does not lead to accidents, it constitutes not only a production but also what Gherardi and Nicolini (2002) call a "safety and danger competence".

The miners' shop-floor culture, survival tactic or knowledge of making a plan embodies an element of pride in overcoming production bottlenecks. It is important to note that the miners' pride in making a plan *(planisa)* is that it is not, as Yarrow (1979) argues, a management dictation per se but a collective initiative and cooperation from which underground gold miners get satisfaction. Underground, men were often praised by their foremen and mine management *(in mining lingua franca, Fanakalo)*, calling them *Yena Madoda* (You are Real Men), for outstanding production results for which they had to make a plan to achieve. Being "real men" entailed a sense of collective heroism on the part of miners and being viewed as "good workers" by their bosses for having safely made a plan to restore production in spite of organisational constraints *(see Kirchhoff and Karlsson, 2012; Kamoche and Maguire, 2010)*.

Ironically, in the event of injury or accident resulting from making a plan, the role of mine management, especially the shift-bosses and mine captains, was overlooked. Mine managers tended to be narrow-minded and easily blamed the workers for taking shortcuts. They often failed to consider a host of organisational and managerial factors that compelled workers to take shortcuts such material shortages, equipment failure and budgetary constraints *(see Nichols, 1997)*. Most important of all was the perpetuation of the work practice of planisa by shift-bosses and mine captains. Nevertheless, Stefan, the Rock Engineering Manager at GoldCo, admitted that the blame cannot be attributed solely to the worker at the rock-face: *"It is just not the poor guy, but probably, it is a broken winch that could not be fixed on time. The shift-boss did not plan for it and the mine captain did not do his part."*

As much as both workers and management are responsible for ensuring workplace health and safety, *"victim blaming"* dominates explanations of occupational injuries and accidents in South African gold mines. As a result, management tends to *"get away with murder"* at the expense of production workers. The drawback of this worker-centred blame-seeking approach to incident investigation is that the only errors of interest are those of the worker or operator *(Hopkins, 1984, 1988; Nichols, 1975, 1997; Sundstrom-Frisk, 1997)*.

Management ought to take responsibility not only by hiding behind the *"careless worker"* explanations of unsafe practices but by improving the design of machinery and organisation of work in ways that do not prompt workers to engage in unsafe work practices *(Hopkins, 1984; Lamm, 1994)*.

MAKING A PLAN (PLANISA) AND THE IRONY OF WORKPLACE RESTRUCTURING

Making a plan inside the pit highlights the limits of workplace change and worker empowerment in a post-apartheid gold mining workplace. At the time of fieldwork, GoldCo had introduced a number of initiatives geared towards efficiency, productivity and equity in the mining workplace. The gold miners' informal work practice of making a plan reveals, as noted above, management blunders in creating an efficient gold mining workplace devoid of organisational inefficiencies. GoldCo was severely under pressure to produce the targeted tonnage of gold. The production pressure which the mine management was under perpetuated the shop-floor tactic of making a plan to ensure that the miners extract gold even in situations of organisational dysfunctions such as budget shortfalls and material shortages.

Moreover, making a plan down the mine highlights the irony of black economic empowerment in a post-apartheid gold mine. Underground black mineworkers' benefits continue to lag behind and there is persistence of the legacy of single-sex hostels and migrant labour. Although the South African mining industry has made good progress in transforming the workplace, the wages of underground black workers are still low when compared to other unionised mining countries such as Canada *(Dansereau, 2006)*.

The bulk of the underground work teams rely on monthly production bonuses to supplement their wages. As a result, underground work teams tend to turn a blind eye on unsafe working conditions due to pressure to meet to production targets and their desire to qualify for bonuses. In doing so, the gold miners failed to exercise their right to refuse working in unsafe work areas as promulgated by the mine health and safety legislation. Therefore, the gold miners' workplace culture of making a plan

ought to be understood in the context of the low wages that are still paid to unskilled and semi- skilled underground workers.

Moreover, as noted earlier, the workers' remarks that they made a plan in order to protect their team leaders and miners from being punished by their shift-bosses and mine captains indicates that there has been no meaningful change on the job authority for black workers. Black team leaders and miners indicated that the inability or lack of skill to make a plan threatened their chances of getting promoted. For this reason, they were tempted to take risks by making a plan to boost their performance records and recognised as *"good workers"* by their bosses. This finding is akin to Kamoche and Maguire's (2010) finding in a British coal mine whereby miners had to rely on their informal knowledge of underground work that entailed taking unnecessary risks in order to be recognised as *"good workers"*. *"Good miners"* had to keep the balance between safety and productivity even if it meant bending bureaucratic rules. Appearing as *"good worker"* in management's eyes boosted the coal miners' job security and financial rewards *(Kamoche and Maguire, 2010)*.

Similarly, at GoldCo, a team leader or miner who failed to dig gold on a frequent basis ran the risk of not being in good terms with his shift-boss and mine captain. Therefore, making a plan was a defensive strategy through which black team leaders and miners pleased their bosses in order to gain promotion to white dominated and most commanding jobs in the organisational hierarchy. Ironically, black workers who got promoted to positions of shift-boss and mine captain were perceived to lack real authority and power in their jobs – akin to an *"upward floating colour bar"* system discovered by Burawoy *(1972)* on the Zambian copper mines. This shows that workplace transformation at GoldCo has, in subtle ways, been accompanied by reproduction of racial boundaries at the point of production *(Vallas, 2003)* despite the enactment of post-apartheid equity legislation.

As much as the gold miners' underground work practice of making a plan entailed violation of known rules, the miners engaged in planisa to rationalise organisational dysfunctions and management inefficiencies at the point of production. The miners' coping strategy of making a plan resonates with the findings of the study conducted in the Hong Kong construction industry, where deliberate violation of work rules was found to be a result of poor management of the construction project *(Lingard and Rowlinson, 1998)*.

By making a plan, the stope workers were able to improvise production in spite of organisational dysfunctions and managerial inefficiencies. The stope workers were not responsible for making requisitions and the purchasing of material. It is the responsibility of production supervisors (miners and shift-bosses) and mine management to ensure that the production crews are provided with sufficient material to run the production process efficiently.

Owing to their tacit knowledge, the stope workers usually succeeded when they *"got on and got by"* or *"muddled through"* (Lindblom, 1959) at the point of production through the work practice of planisa. In practice, making a plan embodies tacit knowledge, creativity and meaning at work. It (planisa) therefore disputes Taylorism's notion that the planning or conception of production must be removed from workers to management. In such a system of management, workers are not expected to conceptualise production but follow managerial rules and regulations *(Thompson and McHugh, 2002)*.

Through planisa, the stope workers not only increased their bonus earnings but also contributed significantly to the profitability of the mine. Both workers and mine management benefit from this alternative work practice *(planisa)* or – to use Goffman's *(1961)* words – *"contained secondary adjustment strategy"*, for offsetting production bottlenecks at the rock-face. Without such an informal plan, stope workers would not have completed their production tasks. Once more, the gold miners' coping strategy of planisa rebuts, to some extent, Taylorism's notion of "soldiering" *(Taylor, 1911, 1947)* – that is workers' tendency to restrict output. The coping strategy of planisa is about facilitating rather than restricting production albeit at the expense of safety.

The miners' informal work practice of planisa can be likened to Burawoy's *(1979)* workplace study of a shop-floor game of making out that workers played in an engineering factory. Burawoy *(1979)* discovered that through the work culture of making out, the machine operators unconsciously manufactured consent to the rules of the company and ethos of capitalism. Although planisa entails conflict on the one side of the coin (in the event of injury or accident), it does entail worker consent on the other side. This is to say that as teams of stope workers *"get on and get by"* or *"muddle through"* in

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response to production bottlenecks and to increase their bonus earnings, they reproduce gold mining capitalism. They expand output, manufacture consent and exhibit commitment to improving the productivity and profitability of the mine. In this instance, they, by default, harmonise and integrate their interests with those of mine management in ways that made sense to them *(Bolton and Houlihan, 2009; Carls, 2009; Collinson and Ackroyd, 2005; Kirchhoff and Karlsson, 2012)*.

Moreover, the miners' coping strategy of making a plan points to the social construction and contestation of skill by capital and labour (Littler, 1982; Shaiken, 1986; Sturdy et al., 1992) in a mining industry where skill was previously defined along racial lines (Webster and Leger, 1992). In other words, there is a need to recognise the existing informal skills of underground work teams and transform the current workplace in such a way that it corresponds to the implementation of the newly instituted forms of workplace organisation that value workplace-based learning, knowledgeable and committed shop-floor employees to organisational goals (Billett, 2001; Gee et al., 1996).

While making a plan is a sine qua non of mining practice, the challenge is to harness the capacities of miners to exercise these occupationally learned skills, while eliminating their unsafe aspects. As stated earlier, planisa disperses responsibility, accountability and conflict from management to the work teams in the event of injuries and accidents. Planisa only works on the assumption that workers possess a rich occupational culture and deploy well-developed tacit skills. Mineworkers consistently claim that mining is easy, but that it is not easy to get it right. This points to the continuous need to be able to take the uncertainties endemic in mining into consideration and find ways of dealing with them efficiently. Mine Health and Safety regulatory institutions also need to take cognisant of the underlying organisational and social processes that trigger risk-taking behaviours such as the gold miners' work practice of making a plan.

CONCLUDING REMARKS

What the gold miners' work culture of making a plan has revealed is that formalised rules and regulations may prevent work from taking place, and informal practices by workers outside the rules may actually enhance organisational efficiency (Devinatz, 1993, 2007; Juravich, 1985; Kamoche and Maguire, 2010; Kusterer, 1978; Pfeffer, 1979). This paper has shown the manner in which underground gold miners bypass work standards that block production by taking shortcuts in the form of making a plan. Planisa, as a particular type of informal work organisation, shows that formal or standardised methods of work organisation are not necessarily more efficient at achieving certain goals than other methods of work organisation.

It can be argued that making a plan down the mine is an act of heedfulness – a calculated risk of "knowing how to get on and get by" (Gherardi and Nicolini, 2002; Iszatt-White, 2007) in adverse working conditions. As much as making a plan entails a breach of safety rules, it would be wrong to suggest this "unofficial" work practice is by all means geared at endangering the lives of mineworkers. This point relates to a research finding in New South Wales underground coal mines that the miners' violation of government-imposed safety standards was not an act of carelessness but an informal strategy through which the coal miners withstood managerial pressure and maintained job control (Hopkins, 1984 cited in Quinlan, 1988).

Although miners chiefly make a plan in order to get the job done, they cannot get it done without having first made the workplace safe. In other words, owing to managerial inefficiencies, underground gold miners steal or borrow material from other gangs and search for material such as timber packs or props in previously mined underground sites, not only to produce but primarily to ensure safety in the stope. Leaving the stope hanging or unsupported by timber packs or props is an unsafe practice. Making a plan is a response aimed at improvising both production and safety at the rock-face.

Furthermore, the work practice of planisa augments Watson's (1980) assertion that work design has to be viewed in the light of the interplay between "official" and "unofficial" aspects of work design. While the official aspects of work design help us to understand the administrative part of the organisation of work, they do not tell us much about the actual behaviour of organisational actors. We therefore need to incorporate the "unofficial" devices, such as planisa down the mine, when conceptualising work organisations.

The miners' day-to-day work practice of making a plan shows that "unofficial" devices are part and parcel of the day-to-day running of the production process, particularly in circumstances whereby workers find the "official" or administrative work procedures less helpful in achieving production goals. It would be unwise not

to recognise the miners' informal coping strategy or survival knowledge of making a plan as a significant, albeit "unofficial", productivity-enhancing initiative with serious repercussions for workplace safety in the event of injury or accident.

The stope workers gained both economic and social advantage when they made a plan underground. For instance, Hopkins (1984, p. 45) discovered that the New South Wales underground coal miners engaged in unofficial work practices "not for the sake of bonus, but for a number of reasons, the most prominent being the desire to make a dirty, boring, physically demanding job a little easier than it would otherwise be".

By making a plan, stope workers escaped the drudgery and boredom associated with industrial work. This contradicts Marx's theory of worker alienation in the capitalist labour process. Making a plan down the mine indicates that workers are creative beings capable of overcoming alienation in the capitalist system of production (Blauner, 1964; Burawoy, 1979; Noon and Blyton, 2007; Roy, 1958; Vallas, 2006).

Apart from its unsafe aspects, the miners' shop-floor work practice of "getting on and getting by" underground is actually to use Lindblom's (1959) words – a science of "muddling through" in the daily running of the production process. As stated earlier, planisa implies both consent and conflict between workers and management, depending on whether it culminates in injuries or not. Mine management also evaded rules and regulations as shift-bosses and mine captains not only recognise planisa, but consistently order workers to make a plan, effectively instructing workers to create their counterplans to get things done. Like workers, mine supervisors and management misbehave by virtue of their participation and vested interest in what may also be called the miners' game of making a plan at the rock-face, or what Richards (2008) calls functional misbehaviour.

Making a plan while down the mine highlights and enhances our understanding of the diversity of worker responses towards organisational strategies and management initiatives (Hodson, 1991; Rosenthal, 2004; Smith, 2009; Thompson and Ackroyd, 1995; Thurnell-Read and Parker, 2008; Willmott, 1993), inasmuch as it embodies consent, resistance, conflict, skill, creativity, identity, pride and prestige "based on their 'functional autonomy' – their control of the skills necessary for production to proceed efficiently" (Hodson, 1995, p. 95). This highlights the activeness (worker agency) rather than the passivity of underground gold miners over a capitalist mining labour process.

Any managerial strategy designed to improve the health, safety and productivity of underground gold miners must recognise, elaborate and systematically articulate the gold miners' work culture of planisa as an existing and alternative work practice in the daily running of the production process. This is especially important if we are to fully understand the limits of contemporary organisational strategies and workers' orientations, agency and resilience towards such strategies.

NOTES

1. Iszatt-White (2007, p. 455) notes that at the road construction and maintenance site she studied "an institutionalised example of heedfulness was the required practice of having a banksman take charge of the manoeuvering of vehicles and lifting gear on busy construction sites. His role was to ensure that sufficient clearance existed between the moving vehicle and any obstacles, including people needing to move about the site. The colour of his hard hat clearly marked him out as the person directing operations, and everyone on the gang looked on him for signals indicating when and where they could safely move. The complexity of the operations being undertaken meant that this active heedfulness and coordination of movement was a necessary addition to the known rules about site safety".
2. Excluding time spent negotiating access to the field site – which took about three months.
3. In South African gold mines, production supervisors or foremen are often referred to as shift-bosses or shift overseers. This thesis uses the terms supervisor, foreman and shift-bosses interchangeably.
4. It is quite a physical job. I took the participants by surprise in that they did not expect a sociologist-of-work (a makhulu skop a Fanakalo term denoting an educated person) to handle such a strenuous job. I viewed myself as a novice in deep-level gold mining prepared to learn from the miners with immense experience in underground work. This is in line with Burawoy et al. (1991, p. x) that "working alongside those we study necessitates a dialogue between the observer and the observed".
5. It would, however, be wrong to downplay the progress GoldCo has made in transforming its South African operations by empowering historically disadvantaged South Africans as defined by the equity legislation. wn

Solar/diesel hybrid power gains ground in mining applications

Diesel engine-driven baseline power generation is one of the main sources of electricity in the mining industry in sub-Saharan Africa, particularly in remote locations where grid connection is prohibitive or impossible.

BY | JACK WARD | MD | POWERMODE

The impact of higher diesel prices has prompted a swing towards renewable energy sources which is gaining momentum. New developments in solar technology are helping mines to reduce dependency on diesel fuel while helping to insulate them from increasingly high and volatile fuel costs in future.

Solar photovoltaic (PV) power is one of the most desirable ways to boost efficiency, minimise energy waste and improve CO_2 emissions at minimum cost.

In South Africa, solar-power has proved to be viable and a reliable energy source, thanks to the country's sunny climate in which solar irradiation is both abundant and free. Moreover, solar PV installations have proven to require less development time before providing attractive yields.

From the mines' perspective, incorporating solar PV power and diesel generated electricity in modern hybrid systems allows fuel bills to be cut significantly, often bringing unprofitable projects back into the black. The quick payback of the solar elements of these systems will return their investment costs in about three years.

This calculation is based on diesel costs of around thirteen rand/litre, assuming specific solar irradiation, generator power and load profiles are considered to determine the optimal PV systems to install. This translates into 22 years of profit, based on current component life expectancies.

SolarPV/diesel hybrid systems work in fully automatic mode by prioritising solar power. A software algorithm ensures the solar PV array operates at its maximum power output at all given solar radiation levels. Only when these drop below a specified point, or at night, are the diesel generators brought up to full capacity.

The Solar PV elements of the system are modular and can be quickly installed anywhere and only minimal maintenance is required to keep them running.

A solar PV/diesel hybrid system typically supplies up to 30% of the daytime energy consumption using solar power, and would save approximately 30% of the fuel used in traditional diesel-only generation.

A key feature of solar PV/diesel hybrid systems is reduced downtime due to generator failures and subsequent repairs since the systems ensure that all the components are used efficiently at optimum rates.

What's more, because diesel generators are used more often at minimum specified load, the power generation operation itself is more eco-friendly.

Apart from the obvious costs benefits gained by using solar PV power, making use of a clean energy source is a way for mining companies to lower their carbon and greenhouse gas emissions and reduce other forms of environmental pollution such as land and water degradation and contamination - thus improving their image with local communities and the eco-friendly lobby.

For mining companies to realise optimum benefits from solar/diesel hybrid systems, the sizing of the various installations will need to be done on a case-by-case basis as every application will be different depending on specific load profiles, solar irradiation and generator setup, influencing the power yield/ fuel saving calculation accordingly.

Solar/diesel hybrid power gains ground in mining applications

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There are two key components of a solar PV/diesel hybrid system. The first is the PV inverter which converts direct current (DC) to alternating current (AC) at the required voltage and frequency for use by the installation's transformers and switching and control circuits. It must remain productive in harsh ambient conditions, such as heat, moisture and salty air, among others, and it should be designed to cope with high voltage and frequency fluctuations.

There are two main inverter configurations; central inverters and string inverters. In the former, a powerful central inverter is fed by a large number of solar panel strings, which are firstly consolidated using string combiner boxes and then linked into the inverter.

In a decentralised system using string inverters, the individual inverters are smaller and simpler and each is fed directly by relatively few solar panel strings. In both cases, the inverters convert the incoming solar panel DC voltage into AC. They are responsible for grid management functions as well.

The choice between a central or string inverter system depends on many factors relating to installation and operating costs. For example, maintenance work on a string inverter system is not complicated. If service is needed, local electricians can replace individual inverters. However, remote monitoring and management are simpler tasks when using central inverters.

An intelligent management system is the second key component of a solar PV/diesel hybrid system. This software-based solution provides the interface between the generator, solar PV system and the load, managing demand-based PV feed-in to the diesel-powered grid. Its performance is directly associated with the value of reduced fuel costs and the reduction in quantity of CO_2 emissions.

Application-specific load profiles, such as heavy-duty industrial loads common in the mining industry, are generally characterised by loads with high starting currents and widely fluctuating load curves. Intelligent system management ensures that generation and load are well matched. Constant system stability should be achieved by reacting quickly to generation and load performance spikes - when a conveyor belt is turned on, for example.

What level of savings can be realised? In a modern solar PV/diesel hybrid solution, the target is to achieve a maximum Solar PV 'penetration' of about 60% of the installed generator capacity. This means 600 kilowatt of solar PV nameplate power can be installed for every megawatt of installed generator power.

As an example, when a one megawatt diesel plant with 24-hour base load generation is supplied with 600 kilowatt of solar power for an average of 4.8 hours per day, savings of between six and seven million litres of fuel can be realised over 25 years – the projected lifespan of many such installations.

This translates into over R 85-million at the current diesel price point. In addition, a reduction in greenhouse gas emissions of over 25,000 tonnes during this period could be achieved by this plant. wn

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What is the impact of the election on Solar in South Africa?

In May 2014 the election took place offering the first opportunity to vote since the beginning of the governments Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) that has driven a South African renewable energy boom.

The fusing together of renewable energy incentives with government policy means that the impacts of the election could have a fall-out for renewable energy. PV-Insider asked key panellists from Kabi Solar, Gauteng Province and Investec Bank, what the impact of the election might be and how it could impact solar developers:

What do you think is the biggest impact of the election on solar in South Africa?

Mike Levington, Director, Kabi Solar: A new Minister (if that is the case) brings the opportunity of a new dispensation with respect to procurement of electricity, and potentially to have the Independent Services and Market Operator (ISMO) Bill brought back on the table. The ANC government has been given a clear mandate by the voters of South Africa to roll out the National Development Plan (NDP) that is underpinned by the National Infrastructure Plan. There is a strong component of renewable energy in the NIP so that hopefully will be good for solar.

Robert Gecelter, Investec Bank: This largely depends on whether the new Minister of Energy remains as enthusiastic as Mr Ben Martins, the current minister, and his predecessor, Ms Dipuo Peters, about the REIPPPP. That said, there does appear to be broad support for REIPPPP and hence I would not expect any significant change whoever becomes the new minister. There is always the chance that Mr Martins will retain his current role. If the elections were going to change the government, maybe there would have an impact, but the retention of the previous government means the policies on solar are going to continue smoothly.

How do you expect pre-election promises relating to solar to be followed through with a consistent policy framework?

ML: I think it is always optimistic to hang too much hope on any promises made by politicians in the lead-up to a general election. However we have a critically low reserve margin in the system, Eskom is already load shedding during the day and we have a massive infrastructure plan that is going to require higher electricity adoption rates than we currently have in the IRP2010. If something breaks this winter, government will have to ask what is the fastest electricity generation technology to bring to market. Solar PV looks good on that measure.

RG: REIPPPP is being effected under the ambit of the Integrated Resource Plan (IRP) and this sets out medium term objectives, so I don't see any changes being made to that.

Oliver Chimusoro, Green Technologies: The policy framework on solar already exists at provincial government, what it means is that the monitoring and evaluation of progress is the major deliverable.

What about the impact on small-scale industrial, commercial and residential development? How is it different at all?

ML: One of the good things about the initial announcement of preferred bidders in October 2013 was that it awoke in industrial and commercial customers the real viability of solar PV making part of the makeup of their electricity supply. Everyone is clamouring to do the first large-scale ground mounted solar PV project in SA, but there are constraints (both historical and technical) why this will be a challenge to do successfully. Also a lot will be dependent upon the naysayers of the ISMO Bill in government really understanding the positive consequences of gazetting the legislation over the political ideology that has stalled it up to now.

RG: There is an already existing small Independent Power Producers (IPP) programme, which is in process. Progress has been slower than expected, but this is understandable given that it takes almost as much effort to do small as large ones.

OC: There is no difference at all but the scale of the projects varies in size.

What are the potential challenges/ opportunities you foresee relating to labour, local content or foreign investment policy, etc?

ML: This is a problem as some foreign multinationals have used the REIPPPP as a means of exporting unemployment and product from Europe to South Africa and this is contradictory to whole philosophy of what the REIPPPP was meant to be about. However, ensuring the long term political support for the procurement process from this perspective is for the relevant government departments to solve, not for solar PV developers. Government gets to set the rules – if they want to leave gaps to allow certain types of behaviour they shouldn't be disappointed with the outcome.

RG: REIPPPP seems to be labour neutral. Renewable projects do create valuable and meaningful employment opportunities especially in construction, and this is welcomed. Local content is a major challenge, and will continue to affect most sponsors. I don't see any changes as a result of the elections.

OC: There is opportunity for job creation in what are popularly known as 'Green Jobs', while at the same time driving local manufacturing of some components such as the frames, glass and assembling thereof.

There is always an opportunity for direct foreign investment because of the nature of the projects. Ratings agency Moody's indicated the election result was 'credit positive' for South Africa, how do you foresee this reflected in project financing/solar PV cost competitiveness for solar developers?

ML: I have tried to understand Moody's position on this and as I see it, their view is that the level of support that the ANC government received will allow it to follow its stated economic policy of using the NDP to create higher levels of economic growth and be less distracted by some of the more leftist views within the tripartite alliance. Plans have never been a problem in South Africa, implementing them has been the challenge and will continue to be so. Project finance costs will come down more because South African financial institutions have now seen many of these projects reach COD and even though this has not been achieved without huge challenges, the private sector has shown its mettle in overcoming them and being on-budget and on-schedule. That has been no mean achievement.

RG: I don't see any changes to the status quo. The rating agencies see the election as credit positive because it returned the status quo, and I would expect that to be the general flavour in the project finance market. Had the elections not worked out well, or been marred by violence, or electoral upsets, then the banking market could have been severely impacted. Fortunately, that was not the case, and hopefully the world sees South Africa as a normalising democracy with the challenges one would expect from that.

OC: The fact that there is continuity in governance it brought the credit positiveness which renders solar PV cost competitiveness.

IN CONCLUSION

This article was written in conjunction with PV Project Development Africa 2014 (9-10 Sept, Joburg), the event is bringing together key industry leaders, such as SolarCapital, Soitec, Aurora Power Solution, Eskom, Juwi Renewables and more to discuss the continued development of the PV industry in Africa. Lessons from the REIPPPP will be analysed and discussed. The future for small-scale PV installations to be part of the African energy mix will also be discussed. wn

To find out more about the event visit the event website on: www.pv-insider.com/solarafrica

Earn CPD Credits

Ethernet Acceptance Testing

BY | KOBUS GRIESEL | PR. ENG | MSAIEE

As engineers, we commission projects or re-integrate systems by relying on acceptance tests. Whether the final outcome is a large civil or industrial project, a replaced component on an assembly line or something intangible such as software, in essence, we need to prove to our customer (and sometimes to ourselves as well) that "it works".

The execution of acceptance tests is usually complex and can almost be considered a subdivision of the particular engineering discipline. While general engineering principles may apply to how such tests are developed and executed; the test criteria are industry specific and depend on how the technology is applied.

The telecommunications industry is no different and acceptance tests are widely used to commission physical links, transmission equipment and services. Various test methodologies are defined by, among others, the Institute of Electrical and Electronics Engineers (IEEE) and International Telecommunication Union (ITU), and specialized instruments exist for this need. The generic term "service" in this article refers to the different types of traffic in an IT network, such as Internet browsing, Video on demand (VoD), Voice over IP (VoIP), File transfer Protocol (FTP), and email.

However, even though acceptance tests are invaluable proof to engineers that a system can be commissioned, they are not obligatory. If a customer does not insist on tests, market forces suggest that they will not be done.The complexity of acceptance tests in general, combined with the abstract nature of telecommunications links and systems in particular, often leads to the assumption that, if a system works, it must be working well. In addition, the techniques and methodologies to test telecoms systems are not generally well known.

Acceptance test methodologies are as diverse as the telecoms industry itself. This article attempts to explore, in practical terms, the use of two types of Ethernet acceptance tests: The IETF's RFC 2544 and ITU-T's Y.1564 recommendation.

WHAT IS ETHERNET?

Ethernet is a data transfer technology used in Local Area Network (LAN) communications. A LAN could potentially be any network that does not make use of leased telecommunication lines. In a typical office network, Ethernet is the underlying

technology that transmits data from one device to the next, such as from a PC, over a LAN (or UTP) cable, to a network switch. Ethernet connections are in the majority not only in a typical office network, but also in more complex networks, such as large corporations, mines and factories. In fact, it can be said that Ethernet is such a prevailing technology today, that in some environments, other technologies are hardly in use.

In the Ethernet world, tests are conducted to ensure that data reaches the desired destination, while ensuring that service specific parameters (i.e. low data loss and minimum transfer delay) are adhered to in order not to negatively impact the quality of service.

Here are some practical examples of types of customers who can benefit from Ethernet testing:

Example #1

A mine has several RF microwave deployments. These links were commissioned with a license for 100Mbps bandwidth, but this seems to be inadequate as some departments are complaining about "slow speed". Does the mine need to purchase a license for higher bandwidth or additional compression functionality, or could the actual throughput be determined? If they buy an additional bandwidth license, can they test and verify the improvement?

Example #2

A company bought a VPN from a service provider to connect their head office to remote office buildings. How can they verify that the link quality and reliability is delivered as contracted?

Example #3

A company upgraded its outgoing Internet connection, but the quality on their VoIP phones continues to suffer. The contractor, responsible for the company's IT, is confident that the network configuration responsible for separating VoIP traffic from other non-essential traffic is correct. Could this configuration be tested in a high utilization environment?

Example #4

A Network Service Provider sells various services such as VoIP, web site hosting and cloud services. To do this it rents third party network infrastructure. Lately there is degradation in quality of some services. Can they test whether the network can still deliver the strict parameters necessary to deliver VoIP services? They suspect something has changed on the third party network, how can they prove it?

Example #5

A company wants to purchase a virtualization platform. Can they predict the user experience on the existing network?

The overriding theme of these questions could very well be that companies feel powerless to address issues related to network infrastructure and IT services.

In all these examples, the issues could be simplified and faults localized by using dedicated test devices and Ethernet specific test methodologies.

RFC2544

The most widely used Ethernet acceptance test methodology is called RFC2544. RFC is an acronym for "Request for Comment", a format used by the IETF (Internet Engineering Task Force) to encourage discussion on draft documents. Once an RFC is peer reviewed and accepted, it could become a standard. This never formally happened in the case of RFC2544, yet it is accepted as the predominant methodology for network equipment commissioning.

The goal of RFC2544 was to "generate traffic that overloads network device resources in order to assess their capacity". It describes six tests, four of which are used on Ethernet systems and are described in Table 1. A typical result from the Throughput test is shown in Figure 1. Each frame size is tested individually. Similar results will be shown for the Frame Delay and Frame Loss test. Some test devices will also record Frame Delay Variation.

The throughput subtest can be used in isolation for a quick and effective way to verify a system's capacity.It is sometimes erroneously believed that the actual throughput can be "seen" on a PC when

TEST	DESCRIPTION
Throughput	This test determines the maximum number of frames per second that can be transmitted without any error. The input frames sizes are user defined but normally the following sizes, in bytes, are used: 64, 128, 256, 512, 1024, 1280 and 1518.
Frame delay	Once the throughput has been determined, this test measures the one-way delay through the device at the throughput rate for all defined frames sizes.
Frame Loss	This test measures the number of frames that fail to reach their destination due to bit error corruption for all defined frames sizes.
Back to Back	This test measures the quickest and longest frames bursts that the device can process without any frame loss.

Table 1: The four Subtests of the RFC 2544 test methodology

Ethernet Acceptance Testing

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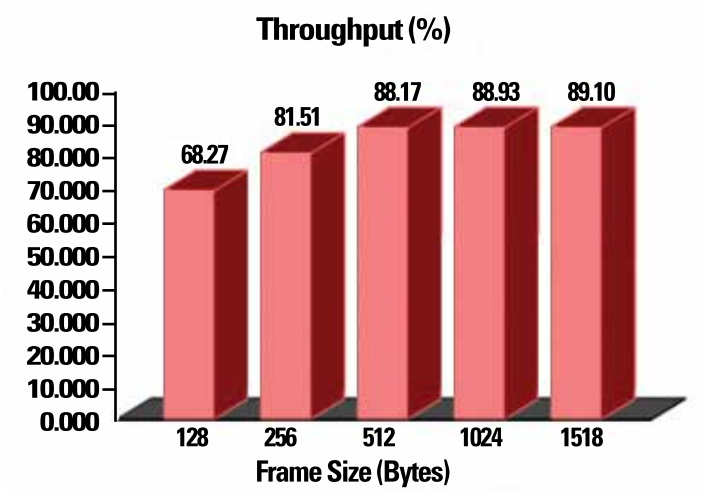


Figure 1: Results of an RFC 2544 throughput test. Each frame size is measured individually.

transferring large files between laptops or downloading a file from a server. The bottleneck in this setup is most likely not to be found in the link itself, but rather in the laptop's own internal processes. In addition, different file transfer protocols (whether FTP, HTTP, SCP, etc.) will show different results. Dedicated Ethernet testers are hardware-based, meaning that irrespective of the line rate (100Mbps, 1Gbps, 10Gbps link and recently 100Gbps), the highest number of data bits per second (0's and 1's) possible will be generated.

It is important to note that RFC 2544 was originally designed to test a single interconnect device, such as a switch or router, preferably in a lab. When it became necessary to also test Ethernet in the context of service activation and service attributes, RFC 2544 was adopted for this purpose, literally because no detailed network (end-to-end) test procedure was available. However, RFC 2544 was only meant to test single devices, let alone links, multiple systems and services.

A new standard, called ITU-T Y.1564, was ratified in 2010 by the by the ITU to remedy the shortcomings of RFC 2544 in this environment.

Y.1564

The Y.1564 test methodology validates links in the form of Service Level Agreements. It measures three of the four Key Performance Indicators (KPI) used in RFC 2544: Throughput, Frame delay and Frame loss. Additionally, it measures Frame Delay Variation, commonly referred to as Jitter. Ethernet frames can be queued and sent in bursts over a network, which means that a packet's arrival time is not predictable at a fixed frequency. Jitter is a measure of a frame's arrival time variability. A low jitter value is critical for time sensitive services such as Video, VoIP and even online gaming.

Y.1564 describes two subtests: A Service Configuration test to be done during the turn-up phase, and a Service Performance test which can be done at any time, potentially also on live networks.

The Service Configuration test is a per-service test to verify the bandwidth and performance requirements of a specific service. As shown in Figure 2, the test is run in 4 phases to check to following:

- Phase 1: Ramp up the throughput to verify that the Committed Information Rate (CIR) can be achieved. CIR refers to the absolute minimum guaranteed throughput of a system. This is typically used for mandatory traffic needed to maintain stability in the network.
- Phase 2: Send more than the maximum allowed throughput to test Extended Information Rate (EIR). EIR is throughput that can be provided if available but cannot be guaranteed.
- Phase 3: Verify that traffic above the EIR is discarded by the network. Traffic should be capped to prevent a network from overloading. For a Service Provider, this result could be used to verify whether one service is over-utilising its share.
- Phase 4: Test whether burst traffic is allowed. Normally a burst of throughput is temporarily allowed on a network to enhance user experience, such a allowing a quick download of a large file.

The importance of adhering to CIR and EIR cannot be overstated, not only to Service Providers, whose SLAs may very well mirror the SLA tested in the service configuration test. In a network, SLAs are necessary to guarantee Quality of Service (QoS). There are many examples. Consider an RF microwave link, with a certain allowed throughput due to known interference. If the throughput is not limited, the system buffer will overflow due to excess traffic, and huge chunks of data will be discarded, which in turn severely affect QoS. In this case, throughput should be limited before reaching the microwave link.

While the Service Configuration test is run for each service individually, the Service Performance test simulates the performance of multiple services running simultaneously and

qualifies KPIs individually.In a typical network, many services are running at variable rates (CIR and EIR), and the network must prioritize traffic flow in order to meet each service's KPIs. Figure 3 shows four services running simultaneously. The total throughput is the cumulative CIR of each service.

CONCLUSION

A common misconception about network systems is that they either work very well, or not at all. The test methodologies defined in RFC 2544 and Y.1564 were designed to find the tipping point of a network's capability, and validate the configuration and performance of services based on KPIs.The results of the KPIs can predict the quality of a service or indicate why a service is not performing. Critically, the tests should be conducted with dedicated hardware based test instruments, primarily because such instruments exclude software processing variables that could influence the test results.

Certainly, for best-effort services such as residential Internet access or a small office, a basic connectivity test to determine access will suffice. However, for corporate customers, who require services with specific performance objectives, there are major benefitsto be derived from acceptance testing, both during the commissioning phase and for trouble-shooting purposes. wn

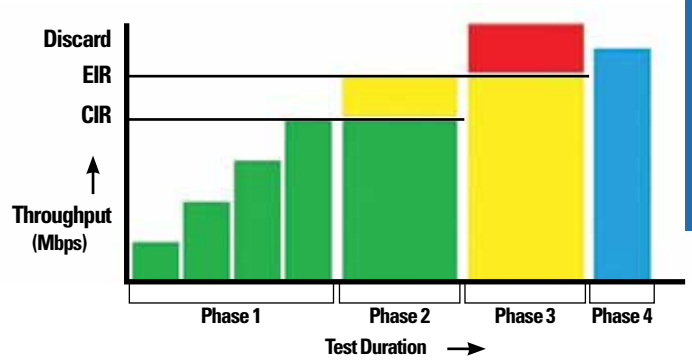


Figure 2: The four phases of the Y.1564 Configuration Test. The duration of each phase is user defined.

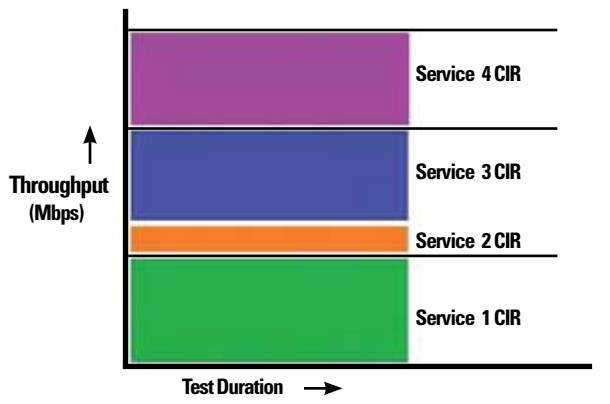
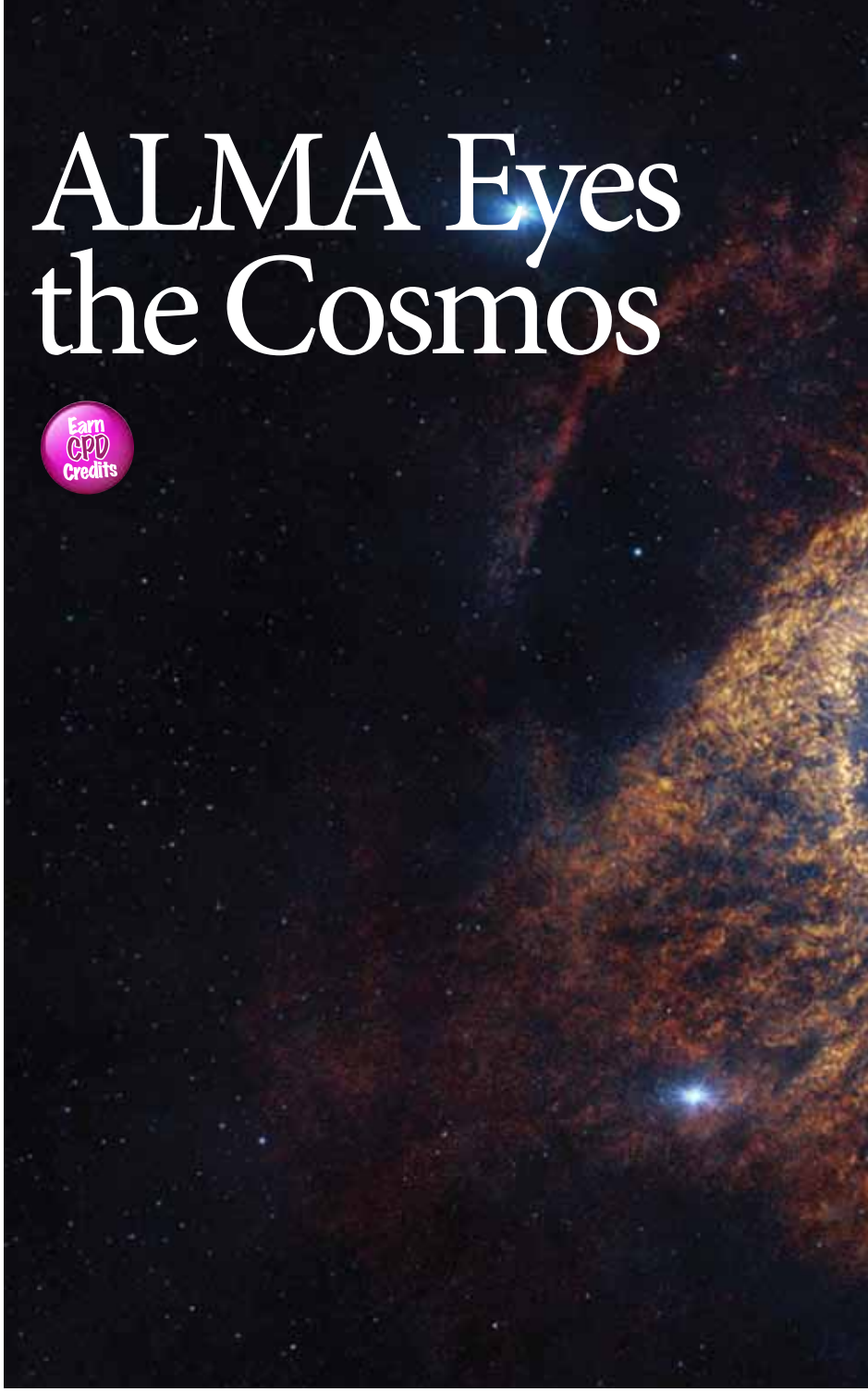


Figure 3: The Performance Test of Y.1564 verifies that the maximum throughput (CIR) of eachservice can run simultaneously.

ALMA Eyes the Cosmos



The ALMA (Atacama Large Millimetre/sub-millimetre interferometer Array) is situated at an altitude of 5 000 m in the Llano de Chajnantor of the Atacama desert, Chile. Because of its dryness, its high altitude, nearly non-existent cloud cover, and lack of light pollution and radio interference from the very widely spaced cities, the desert is one of the best places in the world to conduct astronomical observations. This is at present the largest and most expensive astronomical installation on Earth.

BY | DUDLEY BASSON

ALMA is a partnership project of ESO, North America (NRAO), East Asia and Chile and in co-operation with the Republic of China.

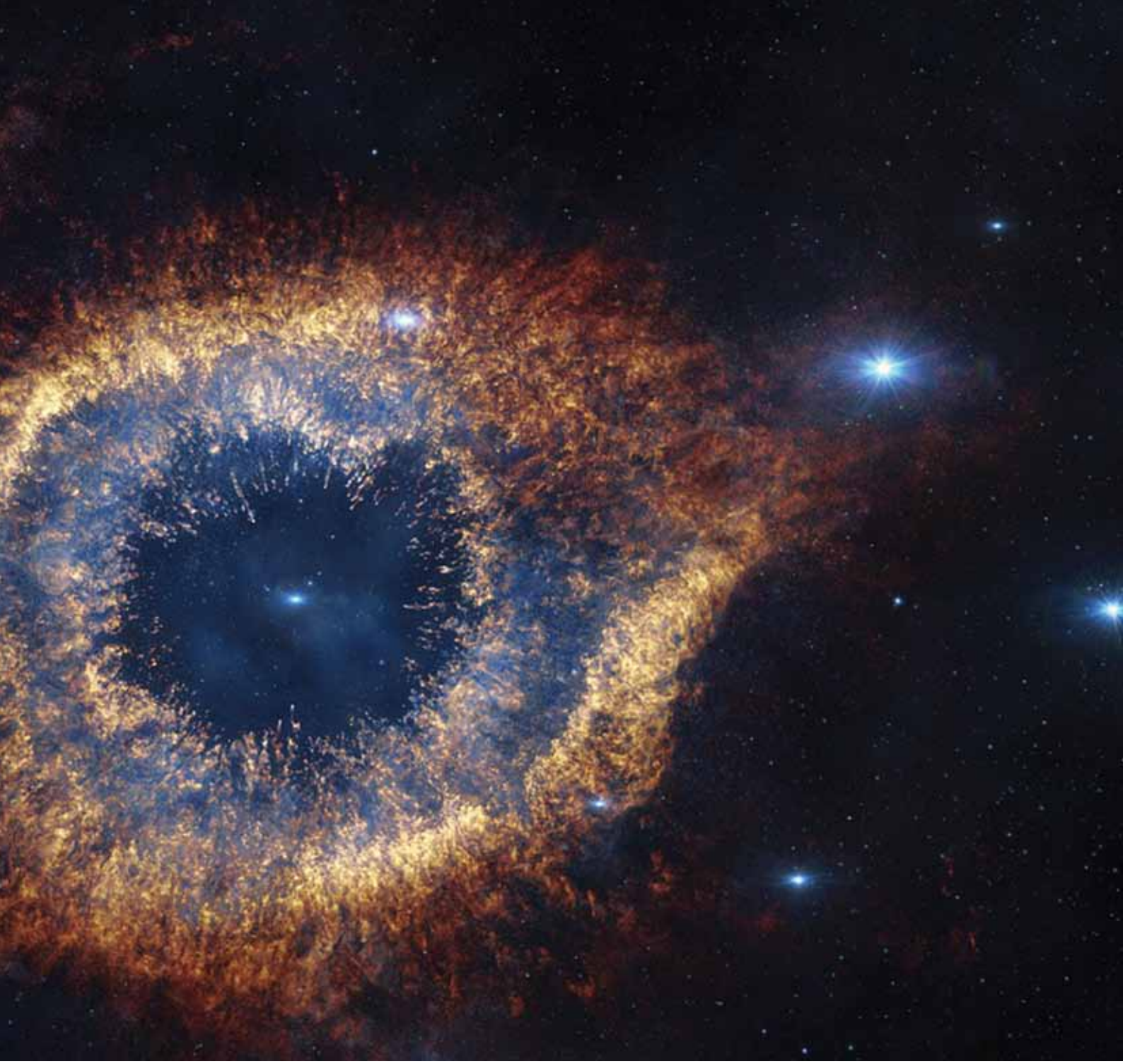
ESO is an acronym for 'European Southern Observatory' or more formally 'European Organization for Astronomical Research in the Southern hemisphere'.

ESO is a consortium of fifteen member states: Austria, Belgium, Brazil, Czech Republic, Denmark, Finland, France, Germany, Italy, the Netherlands, Portugal, Spain, Sweden, Switzerland, and the UK.

ESO's most prominent observatory is the magnificent group of four very large optical telescopes with 8,2 m mirrors on the summit of Cerro Paranal. These telescopes, named Antu, Kueyen, Melipal and Yepun are modern marvels of optics, physics, engineering and computer science.

On opening the ALMA observatory on 13 March 2013, before a glittering 500 strong audience of the President of Chile, ambassadors, academics, research directors and scientists, Thijs de Graauw, director of ALMA declared:

"We are living in a historic moment for science and particularly for astronomy, and perhaps also for the evolution of humanity, as we start to use the Earth's greatest observatory. The human



species' most complex ground-based astronomy observatory – on Chile's Chajnantor plateau, Atacama desert, some 1500 kilometres north of Santiago – opens for business today."

In his inaugural address, President Sebastián Piñera of Chile said:

"One of our many natural resources is Chile's spectacular night sky. I believe that science has been a vital contributor to the development of Chile in recent years. I am very proud of our international collaborations in astronomy, of which ALMA is the latest, and biggest outcome."

Pierre Cox became the new ALMA director from 1 April 2013.

As a precursor to ALMA, the APEX (Atacama Pathfinder Experiment) was launched and inaugurated in September 2005 at the ALMA site. The optics are Cassegrain with primary and secondary dishes of aluminium. The primary parabolic dish of 12 m diameter has a surface accuracy of 17 microns (about a fifth of the thickness of copier paper). The hyperboloidal secondary dish has a diameter of 0,75 m. The observation wavelengths are from 0,2 to 1,5 mm. The observatory has a mass of 125 tons.

The detection instrument is a 300 pixel bolometer array cooled to an

ALMA Eyes the Cosmos

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astonishing 0,3 kelvin. Instruments can be mounted at the Cassegrain as well as both Nasmyth focal points. The telescope was designed and manufactured by VERTEX Antennentechnik GmbH, Duisberg, Germany. This was the first large submillimetre telescope in the Southern hemisphere and the results have been spectacular. Another large submillimetre telescope (in the Northern hemisphere) is the 15 m James Clerk Maxwell telescope installed on Mauna Kea in Hawaii. This highly successful and productive instrument has sadly succumbed to budget constraints and has been offered for sale.

The ALMA observatory has a complement of 66 antennae, 54 of 12 m diameter and 12 of 7 m. The antennae are movable and can be configured to an array within a circle of 200 m diameter or extended over an area of 15 km diameter depending on interferometric requirements.

An initial order for 25 antennae of 12 m diameter was placed with General Dynamics for delivery in 2007. Four 12 m and twelve 7 m antennae were supplied from East Asia and the final delivery of 25 12 m antennae from the European AEM consortium on 1 October 2013. The antennae receive signals in ten bands of frequencies from 31 GHz (9,67 mm) to 950 GHz (0,316 mm). The largest single element of the Front End system is the cryostat with attached cryo-cooler which cools the receivers to an extreme 4 kelvins. The highly specialized receivers for the ten bands are manufactured in France, Canada, Japan, the Netherlands, USA and Sweden.

The requirement for processing the vast volume of interferometric data from the antennae is enormous. This is handled by the ALMA Correlator, a special-purpose supercomputer processing at 17 petaflops (17 x 1015 floating point operations per second). Processing at this speed is not possible for a single processor – the ALMA Correlator has an array of 134 million processors. Spinning computer disks could not be used as the air is too thin to maintain the read-head gaps. The Correlator has a power requirement of 140 kW.

The world record for supercomputer processing speed is currently held by China's Tianhe-2, processing at 33,86 petaflops. 'Tianhe' can be translated as 'Sky River' or 'Milky Way'. Processing for the vast SKA (Square Kilometre Array) project in South Africa and Australia/New Zealand will probably be in the exaflops range but it seems quite likely that supercomputers will attain this speed before the SKA becomes fully operational in 2024. It is expected that ALMA will provide useful testbed information for the SKA. The SKA will operate in longer wavelengths than ALMA (30 mm to 4,3 m) and the thousands of antennae will be installed at low altitude.

Moving the 115 ton antennae from the Operations Support Facility (OSF) at 2900 m altitude to the observatory site at 5000 m altitude was a major engineering enterprise in itself. Haulage was achieved by two 28-wheel self-loading 130 ton heavy haulers manufactured by Scheuerle Fahrzeugfabrik GmbH, Pfedelbach, Germany. Scheuerle regularly builds transporters with capacities of over 1000 tons and loads of 16 000 tons have been moved by their equipment. The cost of the road was estimated to be more than that of the two vehicles so it was found advisable to design the 28 km road in conjunction with the vehicles. The road was subsequently topped with locally quarried salt to keep the dust down. Scheuerle is a world leader in hydrostatically propelled module and shipyard transporters. The vehicles were designed for operation at 5000 m altitude which included an oxygen supply for the crew. The design was largely innovative as there were no practical precedents of haulers of this type designed for operation above 3000 m. Safety interlocks and supervision systems have been provided to block dangerous commands given by a driver whose judgment may have become impaired at the high altitude.

Heavy haulage is always dangerous and more so at high altitude. The driver's cab is underslung beneath the load giving the driver an unobstructed view of all the wheels as well as the road edges. Four CCTV cameras provide additional visbility. The vehicles can also be driven by remote control. (Definitely not something for schoolboys to play with). The monster vehicles are 20 m long, 10 m wide and 6 m high. Each vehicle is provided with two power units each containing a diesel engine, hydraulic pump, fuel, oil and coolant tanks. The huge self-contained power units can be exchanged as needs be and the vehicle can also be driven with one power unit in an emergency. Each power unit has a capacity of 500 kW at low altitude and 320 kW at 5000 m. The electric power generator has a capacity of 100 kW at low altitude and 50 kW at 5000 m.

The antennae have to be powered on, even during transport, to maintain the cryogenic cooling of the detectors. The vehicles have 28 wheels in pairs on 14 bogies with a wheel load of 10 tons per wheel. All the wheels are powered by hydraulic

motors, have four selectable programs for computer controlled steering and are provided with oil immersed multiple disc service brakes as well as parking brakes. The bogies are provided with hydraulic damping to minimize the effect of any road corrugations which might damage the antennae. In the event of a bogie becoming inoperable, it can be raised so as not to interrupt the transportation. The heavy haulers are a permanent feature of the observatory as they are needed to move the antennae from time to time to suit different interferometer configurations. The vehicles are provided with laser facilities for the positioning and anti-collision systems. The positioning system can place the vehicle to within a few centimeters. The vehicles were designed with a U shape to facilitate self loading. The vehicle could reverse up to the antenna enclosing it between the two long sides of the vehicle. Saddles on rails mounted on long inclined girders would then engage the lifting brackets on the antenna, which could then be pulled to the centre of the vehicle, well clear of the road. The transporters arrived in Chile on 14 February 2008 and were successfully commissioned at the OSF in the following months.

Detailed information is available to scientists wishing to submit proposals to ALMA.

Proposals for early science Cycle-0 were due on 30 June 2011. The 919 proposals were evaluated by 50 science assessors and 25 technical assessors. The 112 highest priority projects were selected for science operations starting on 30 September 2011.

By November 2012, scientific assessments of 1133 proposals for Cycle-1 had been completed. Seventy eight assessors from around the globe evaluated the scientific value of the proposals after which technical feasibility was confirmed by fifteen technical assessors. The list was shortlisted to 196 highest priority projects. Selected projects occupied the five categories as follows:

ALMA Eyes the Cosmos

continues from page 53

1. Cosmology and the high redshift universe. 25,7%
2. Galaxies and galactic nuclei. 26,0%
3. Interstellar medium, star formation and astrochemistry. 20,0%
4. Circumstellar disks, exoplanets and the solar system. 17,4%
5. Star evolution and the Sun. 10,9%

Confirmed proposals for Cycle-2 will be scheduled from June 2014 to October 2015. So far 1382 proposals have been submitted.

Early testing of ALMA using only twelve closely spaced antennae produced a remarkable image of the antennae galaxies.

These are colliding galaxies discovered by William Herschel in 1785. These are known as the antennae galaxies because of long curved trails of stars left behind before the collision looking much like the antennae of an insect. ALMA was able to detect vast clouds of gas, billions of times the mass of the Sun which will give birth to new generations of stars.

A most remarkable and spectacular composite image was made showing ALMA's colour enhanced submillimetre image combined with a Hubble visible and infrared image.

In the early stages of ALMA, a team of astronomers using less than a quarter of the full complement of 66 antennae, pinpointed with unprecedented sensitivity, the locations of over 100 of the most distant star-forming galaxies in the early universe. ALMA is so powerful that, in just a few hours, it captured as many observations of these galaxies as have been made by all similar telescopes worldwide over a span of more than a decade.

On 17 January 2014 a Japanese research team led by astronomers of Osaka and Ibaraki Universities announced their results with ALMA observing a protoplanetary disk around a star in the Lupus constellation.

Their results showed that it was highly likely that a planet was being formed far out from the parent star. Further research is planned with this and other protoplanetary disks.

From results of the hugely successful Kepler planet finding mission, it is currently thought that planets are as plentiful as stars, which suggests that there are several hundred billion planets in the Milky Way galaxy alone. Of these the number of Earth-sized planets would be at least 17 billion. To put it another way – there are more than twice as many Earth-sized planets in the Milky Way galaxy as there are humans on planet Earth.

ALMA is situated in the best spot on Earth for astronomy but it is not hospitable to humans. The atmospheric pressure and oxygen availability are reduced by 50% and the ambient temperature never rises above freezing.

Fortunately the scientists do not need to go there. They can study the observational results of their scientific proposals at their own convenience on their own computers. WN

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August

COMPILED BY | JANE BUISSON-STREET
SMSAIEE | PMIITPSA

This month was originally named *Sextili* in Latin, because it was the sixth month in the original ten-month Roman calendar under Romulus in 753 BC, when March was the first month of the year.

1 August

1941 The first jeep rolled off the assembly line. Willy's Truck Company was the first company to create a jeep.

2 August

1904 Michael Owens patented a machine that could automatically manufacture glass bottles. This machine could produce four bottles per second. Owens's invention revolutionized the glass industry.

3 August

1900 The Firestone Tire and Rubber Company was founded to supply pneumatic tyres for wagons, buggies, and other forms of wheeled transportation common in the era.

4 August

1970 POPPIN' FRESH aka The Pillsbury Doughboy was trademark registered by the Pillsbury Company.

5 August

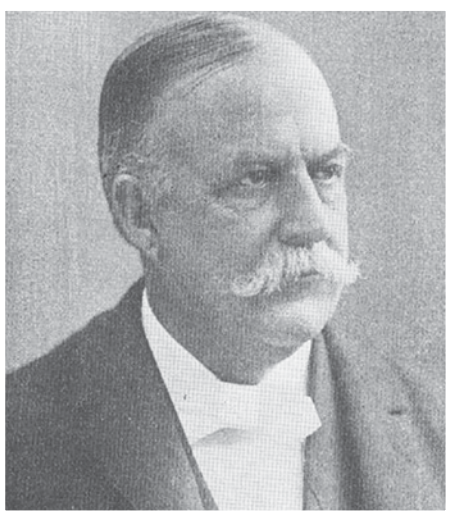
1997 Patent #5,652,975 for an automatic talking-potty apparatus with a gender-selection switch was issued to Glory Hoskin.

6 August

1935 American physicist, William Coolidge, received a patent for the cathode ray tube, a key component of televisions and other electronics applications.

7 August

1944 The world's first program-controlled calculator, the Automatic Sequence Controlled Calculator was inaugurated.



8 August

1911 US Patent No. 1,000,000 (i.e. the millionth) was issued to Francis Holton for his 'non-puncturable' automobile tyre that is still keeping countless vehicles on the go.

9 August

1173 Construction of the campanile (a tower design to hold bells) of the Cathedral of Pisa (now known as the Leaning Tower of Pisa) began; it took two centuries to complete.

10 August

1909 Reports indicate that a sizeable gold deposit had been found in the Banket formation, Rhodesia, which extends for over six miles underground.

11 August

1929 Babe Ruth becomes 1st to hit 500 homers (off Willis Hudlin of Cleve)

12 August

1981 IBM introduces its first Personal Computer (PC & DOS version 1.0)

13 August

1889 Samuel Leeds Allen was issued a patent for the Flexible Flyer Sled, which for over one hundred years has been the best selling, and most famous American sled.

14 August

1984 IBM released MS-DOS version 3.0.

15 August

1965 The Beatles play to nearly 60,000 fans at Shea Stadium in New York, New York, an event later regarded as the birth of stadium rock.

16 August

1930 The first colour animated sound cartoon, Fiddlesticks, was released by Ub Iwerks. It was the first animated sound cartoon that was photographed in two-strip Technicolor.

17 August

1977 The Soviet icebreaker Arktika became the first surface ship to reach the North Pole.

18 August

1949 The first ever horticulture patent assignment: Plant Patent No. 1, issued to New Jersey's Henry Bosenberg for his climbing rose.

19 August

1888 The first world beauty contest was held in Belgium, an 18-year-old West Indian woman won.

20 August

1930 Inventor Philo Farnsworth was issued a US Patent for his television system, the first working all-electronic system. Often referred to as the Father of Television, Farnsworth's invention was based on a design he had conceived as a 14-year-old.

21 August

1888 William Burroughs received a patent for the first practical adding and listing machine, also known as a calculator.

22 August

1926 Gold discovered in Johannesburg, South Africa.

23 August

1617 Albemarle Street, London, England became the first one-way street.

24 August

1853 Potato chips were prepared for the first time by Chef George Crum who was trying to appease an unhappy customer. He sliced the potatoes very thin, fried them until crisp and seasoned them with extra salt. The customer loved them.

25 August

1920 Ethelda Marguerite Bleibtrey was the first female gold medal winner in three categories at the 1920 Summer Olympics in Antwerp, Belgium.

26 August

1968 "Hey Jude" was released as the first single from the Beatles' record label Apple Records.

27 August

1859 Petroleum is discovered in Titusville, Pennsylvania leading to the world's first commercially successful oil well.

28 August

1951 Oral B (the famous line of dental products) was trademark registered.

29 August

1885 Gottlieb Daimler receives German patent for a motorcycle

30 August

1994 IBM announced it would not oppose Microsoft's attempt to trademark the name "Windows."

31 August

1897 Thomas Edison patents the Kinetoscope, the predecessor to movie projector.

A CONVERSATION WITH A FRIEND : WOLF WEIDEMANN

Discounting and Tendering

A few of my class mates from the then five-year engineering course of the "Universiteit van Stellenbosch" are still very much alive. Two of us met recently and this led to the following dialogue. As you'll note, my friend is very much a people person who asks a lot of questions!

You look well, Wolf. Still going strong with your courses?

Yes, I have now trained about 2 200 people, in some 180 events, with my "Business Finances for Built-Environment Professionals" and "Handling Projects in a Consulting Engineer's Practice" courses. That's an average of a dozen participants per course. This format lends itself to interesting discussions. I've learned a lot and really got to know what is going on at grass-roots level.

Are your two courses equally in demand?

Unfortunately not. Engineers still prefer to learn how to give excellent service and are either not interested in Finances or shy away from the subject because of the jargon which cloaks it in obtuseness and apparent difficulty. Basically, most engineers are and stay financially illiterate.

What seem to be the main concerns of the consulting engineering profession today?

Well, Allyson Lawless already in 2005 pointed out in her book *"Numbers & Needs"* that there was an alarming dearth of engineers in the municipalities, actually of the entire engineering cadre. Since then other surveys revealed that the number of engineers in all tiers of government has dropped from about 5 000 in 1994 to 2 000 in 2010. What is more, a City Engineer now has to report to a lay politician City Manager. Elsewhere in government similar skewed engineering hierarchies prevail, for instance laymen as Directors General.

Wouldn't this shortage create a booming demand for Consulting Engineering Services?

Theoretically yes, but we now have no knowledgeable clients to communicate with who could appoint us to do what sorely needs to be done to rebuild and improve South Africa's infrastructure. Instead, there is an increasing external bureaucratization of what used to be a "free" autonomous and self-regulating profession.

What exactly do you mean?

The fact that all tiers of government now follow, or should follow, the Construction Industry Development Board's rules, is a welcome development of standardisation. However, the broad government also forms what is known as a monopsony that is a single buyer, as contrasted to a monopoly, a single seller. In this sense there is no longer a "free market" for our services and government more or less dictates our way of doing business with it.

Why does this matter? What are the consequences?

We now have a whole generation of Consulting Engineers that has entered practice unaware of other ways of appointment than by Discounting and Tendering, nor do they realise what havoc these procedures cause. Private clients, too, have been infected to a large degree. I'll paraphrase what the polymath statesman Benjamin Franklin wrote in 1789 *"In this world nothing can be said to be certain, except death and taxes"*. In the present state of the consulting engineering profession nothing is certain except Discounting and Tendering.

Discounting is not a new development – I personally like to shop wholesale whenever I can, or go to sales to benefit from lower prices. I am also amused by the TV ad "Buy this shock absorber and get the other one for free." Why is this different?

Your wholesale example is a quantity discount, which we too have been willing to give for repeated similar appointments by a client who pays promptly. As a matter of fact, years ago we often negotiated our recommended fees, sometimes downwards as in the mentioned case, but also sometimes upwards, for difficult or particularly challenging projects. The present approach of "discount or else!" is completely one-sided. The shock absorber people, on the other hand, simply pre-increase their "published" price, up front, so that after the discount they are back to their desired gross profit. Maybe that is what The Engineering Council of South Africa's (ECSA) Fees Committee should do? Recalculate the published recommended fees upwards so as to still render an adequate rate of return after discounting? Isn't that a bright idea?!

Bright, yes. But practical, no!

Do you recall the excellent article *"From the CEO's Desk"* on Discounting in Civil Engineering of June, 2011?

Yes, I receive this publication and read it thoroughly.

Our discounting goes much further than a mere reduction of recommended fees. We accept limits on reimbursables. We render additional free services, which then are not covered by our Indemnity Insurance. We go into too much detail in design – fifty or so years ago we focused on establishing the client's real needs and translated them into a conceptual design. We then overviewed and inspected the detail design of the contractor. Now we do the full design at discounted fees. We also often develop novel or innovative techniques and do not charge for the expense of their development. The notorious "working at risk" should also provide much higher returns than a straight appointment. If not, this too is a form of discounting.

A huge load today's consultants also have to bear unwillingly for free, is acting as bankers for the client. Reports show that the industry's fees outstanding for longer than three months approach five billion rand! Just imagine what this costs the firms in financing charges!

Most important, though, is the fact that our discount is not applied to an existing physical, tangible, finished, perhaps even well-known product which one buys off the shelf. We discount "promises", and in this regard tendering, too, is irrational.

Why do you sound so upset?

Because few people realise what happens after decreasing the income needed to cover costs.

Could you not just reduce your costs?

Of course that is what we are forced to do! But the effects then are lower dividends for the shareholders, perhaps even a buy-out of the now "cheap" practice by a non-South African firm – nine big practices so far – and lower salaries which do not attract the best engineering people. Did you know that at one stage in far-gone times our status as engineers was nearly on a par with that of doctors, lawyers, chartered accountants and auditors? Well, today we are far behind - and our children know this when deciding on a career.

By the way, the National Development Plan presupposes that there will be sufficient engineers to carry out the technical and engineering requirements by 2030. However, as Prof. Ian Jandrell of Wits pointed out by reverse planning from that date, those engineers would be in Grade 3 by now. Given the poor standing of our schools regarding Science and Mathematics in the Global Competitiveness Report of the World Economic Forum – last of 148 countries – it is doubtful whether there will, indeed, be enough engineers by 2030.

I suppose similar reasoning, including the very low trade-test numbers, would apply to technicians, artisans, technologists and so forth as well?

Indeed, this is so. Talking of remuneration, of course there are many engineers who just love engineering and are glad if someone pays them a pittance to practice their hobby. However, due to discounting they now perforce have to work even longer hours for the same pay, leading to fatigue and errors. They also have less time to properly liaise and consult with the Client, to walk the 'extra mile', nor is there money for non-reimbursable extras. There is no time to investigate design alternatives nor for optimisation. There is no time to develop innovative solutions for the client's problems, with other words no time to decrease final project costs or increase the internal rate of return. There is neither time nor money for staff training and development. We also do not have time for properly mentoring juniors who then have to gain experience at the client's expense. The IT equipment and programs which we cannot afford to upgrade become obsolete. Another service also falls by the wayside, which today is especially important with inexperienced contractors, and that is over-viewing and monitoring their performance more often and more thoroughly as found necessary than agreed to in our appointment.

Yes, I too have become aware of previously unheard problems or failures of engineering works, such as falling shopping centre roofs. Buildings, on-ramps and bridges collapse under erection, even a dam failed during construction.

Obviously time pressure increases chances for mishaps and mistakes. Ironically, these lead to more Indemnity Insurance claims, which in turn lead to higher premiums, which increase our costs even more! It is a vicious circle! But then as Lord John Ruskin already wrote two centuries ago *"The common law of business balance prohibits paying a little and getting a lot — it can't be done."* He also warned *"There is hardly anything in the world that some man cannot make a little worse and sell a little cheaper and the people who consider price only are this man's lawful prey."*

Does this apply to tendering as well?

Without a doubt! The lack of knowledge about the nature and processes of consulting engineering is reflected in that Treasury lists our services under "goods". It is precisely the fact that they are not existing physical, tangible, finished, perhaps even well-known products which one buys off the shelf, which causes problems. I often joke that our "tendering of promises" is the inverse of a marriage proposal, where the highest bidder wins.

The tremendous "leverage" of the Consulting Engineer's input on the total, i.e. life-cycle costs of a project, is not understood nor appreciated. I often ask a client whether he'd rather save on the total projects costs or merely on the consulting engineer's fee. More often than not, cutting the engineer's fee will not only lead to a project of lower quality, but also one which is considerably more expensive than the savings on fees. As an example, a 25 % fee discount by the electrical consulting engineer will save a mere ½ % of the project life cycle costs, while the contractor could

A Bandana Can Save A Life

Hopes, dreams and aspirations! We all have them. As a parent, all we wish for our children is for them to grow up happy, healthy and to achieve their own goals. Most children want to be a doctor, a chef, a policeman, a champion boxer or even an electrical engineer. The possibilities for their future are endless.

Just imagine if one day you receive that devastating diagnosis that your child has a life threatening blood disorder like leukaemia? All dreams are immediately shattered. Your world becomes a dark, scary place filled with incredible emotion, terror and sheer helplessness. This time as a parent, your ever faithful 'fix it' band aid or comforting kiss, cannot make it better.

The reality for countless patients is the uncertainty of what the future holds for them. Their dreams and aspirations are placed on hold. For many patients their only hope is to receive a much needed bone marrow stem cell transplant.

You could be their only hope! For R25, buy your brightly coloured bandana and contribute towards saving a life.

Funds raised through National Bandana Day go towards paying for the expensive tissue typing (DNA) tests for new donors to join The South African Bone Marrow Registry (SABMR). This offers patients the hope of finding their life-saving donor match.

12th October is National Bandana Day. The Sunflower Fund encourages the public to buy a bandana from their nearest Pick n Pay or local Round Table, including Namibia and wear it to show their support towards the brave fight that these patients face on a daily basis when they lose their hair from their chemotherapy treatments.

"Please support this campaign and help make a difference as together, we can save more lives. We cannot do this without your support", implores Tarryn Corlett, Chief Operating Officer for The Sunflower Fund.

DID YOU KNOW?

- It only takes two test tubes of blood to register you as a donor.
- It won't cost you anything. The Sunflower Fund sponsors the R2000 test cost on your behalf.

CRITERIA TO BECOME A DONOR

- Donors must be committed to help anyone and not just the patient that motivated them to join The Registry.
- Donors must be between 18 – 45 years of age.
- Donors must be in general good health (with no history of hepatitis or sexually transmitted diseases).
- Donors must weigh over 50kgs with a BMI > 35 and preferably, but not necessarily be a blood donor.

IF YOU ARE EVER FOUND TO BE A MATCH, WHAT IS THE PROCESS?

- The process to donate bone marrow stem cells is no more invasive than donating blood where you are linked to a blood separating machine for four to six hours.
- The precious bone marrow stem cells are filtered out of your blood and your own blood then returned to you. There is no drilling into your bones for bone marrow.
- You are able to go home immediately afterwards.

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easily have to increase the contract amount by 5 % due to the risks of a poor design and specification!

I think that I once bragged about our first lady President of the then SA Association of Consulting Engineers, Althea, the engineer married to former rugby springbok Shaun Povey?

I can remember her as being in the news quite often.

Well, Althea visited many clients and amongst their complaints about unethical behaviour by consulting engineers, which she reported at the 2005 AGM, was "Excessive discounting and too low tender prices which later lead to curtailed and/or low-quality service." Can you believe it? The selfsame people who forced us to do this now complain that we indeed did it!

Of course our ECSA Act also contains a warning against discounting, not so?

You remember correctly. The Engineering Profession of South Africa Act of 1990, also the Act of 2000, both forbid engineers to lower the fee, or "doing work under any conditions or terms that would compromise their ability to carry out their responsibilities in accordance with acceptable professional standards." Of course doing this could also jeopardise their Professional Indemnity Insurance.

There is also the question of multiplication of scarce engineering time: where there once was a series of discussions with the client, usually resulting in a report or submission, we now have the client with some possibly inadequate engineering knowledge having to draw up a document on which the engineer can tender, that is make an offer in certain and definite terms, containing all terms to create a contract, communicated to the offeree. Obviously there must be no less than two firms tendering, and hence this is at least trebles the effort and wastes engineering time.

It is interesting to know that we inherited tendering for professional services from the state of Maryland in the USA, and started this fashion in about 1985. Today, in the USA and Canada, Quality Based Selection is enshrined in Law! Even the World Bank has advised that consulting costs should not be an overriding criterion for selection. Botswana, also, has tried and now discarded tendering, as wasting manpower and inviting corruption.

This all sounds somewhat troublesome, even depressing. What are consulting engineers doing about the situation?

The past CEO of CESA, Graham Pirie, has published numerous articles and comments and has participated vigorously in various discussions. Others have put forth well-reasoned proposals for alternative appointment procedures. But there has been disappointing impact and slow progress.

I once read the wise words by Paul Gilbert of the Skills Training Consultancy for Lawyers (of all professions!) in the UK: *"I firmly believe that what Clients want can be described in a very few words: A relationship they trust, with people they respect, where commitments are kept, and where value is clear."* The tendering system simply cannot satisfy these wants. Indeed, the breakdown of the traditional fiduciary relationship, one of trust, between Client and Consultant to my mind is the most serious consequence. Our only defence then is to become and act like "design contractors" and to stop trying to be the trusted advisors of old!

That would really be sad. I clearly remember and relish the excellent team work which our department enjoyed with our consulting engineers. Of course there occasionally were some arguments about fees, also differences of opinion during the design phases, but these debates always were held in a constructive spirit and furthered important aspects of our projects.

Let's drink to the return of those happy days! Cheers!

M I N E - ing

Who ever thought that whining and mining are closely linked? Oh but they are, let me explain how…..

BY I ANGELA PRICE

MINE - one of the first words my young daughter ever uttered. I was floored….where had she heard it used? After all, we don't go around laying claim to things, but out it pops as word no 2 (after Dada).

As her vocab increased so did her TV watching (or maybe it was the other way around) and it was downhill from there. Soon we reached that sad point in every parent's life when you realise that your kids' DVD collection has surpassed your own - even sadder still is the moment you catch yourself, mid-chorus belting out the 'Frozen' theme tune with them *(Hubby is worried about our 3 yr. old son's emulation of the female lead's song rendition)*.

Very soon you find your speech peppered with quotes from the many animated Disney productions *("I am surrounded by idiots!" - The Lion Kings Scar, is one I often have reason to use)*. Another well-worn one in our house is the scene from 'Finding Nemo' featuring a flock of seagulls who are portrayed as mindless consuming/eating machines who only shout one word: *"Mine! Mine! Mine"*. The kids use it too, usually when there is something nice for them to share: they all pounce at once, yelling *"mine, mine, mine"*.

Without wishing to trivialise the recent mining strikes, union bosses demands, certain parties' opinions on mine nationalisation etc. - when thinking about it all I just hear shouts of 'mine, mine, mine' in the background (or maybe that's the kids actually fighting).

Experience gained in my household has taught me that 'mine-ing' and whining are closely related, both just different sides of the same coin, with one inevitably following the other in no specific order.

The scenario generally runs like this:
(Note - if you are bored by the home life/domestic analogy which follows below, please use one of the words in brackets for a more SA/national view)

- Child (government, political parties, private individuals) spots a desirable item (land, mineral resources, business opportunities) i.e. a toy car.
- The individual lays claim to it/the item.
- And proceeds to enjoy benefits of item (mineral wealth, produce, financial wealth, a booming business, personal success) - picture a child making 'vroom vroom' noises along the carpet.
- Other parties present realise someone is having more fun (making more money) than them and want a piece of the action.
- They start whining (media, political parties, monopolising) about wanting item X, raising hell…complaining to Mommy (government) etc.
- Since Mummy (government) is not intervening fast enough, they muscle in with their own solution and make a grab for the item in demand.
- Shouts of *'mine, mine, mine'* ensue.
- Chaos descends, an authority/parent figure (government, the SAPS) has to step in to restore 'order'.

The end result? Damaged relationships, sometimes injury and quite likely the toy car is now broken or damaged - unusable by anyone for the foreseeable future.

"Can't you all just get along?" asks mom in frustration. Sometimes that's what I mutter as I listen to the news each morning, all I seem to hear is a lot of bickering 'children', driven (ultimately) by some form of greed.

Little children lack common sense, but as adults we should not. SA has many 'golden eggs' - the mineral resources beneath us are just one example.

But 'mine-ing' and fighting over it all will likely have one end result, a no-win situation for all. 'All for one and one for all' I mutter - however will we get there in SA? Maybe we should stop the whining and 'mine-ing'. wn

Calendar of events

If you want to see your function or event listed here, please send the details to Minx Avrabos at minx@saiee.org.za

AUGUST 2014

5-6	High Temperature Low Sag Overhead Line Conductors	CPD training Course, Johannesburg	www.saiee.org.za
7	Electric Arc Flash Safety	CPD training Course, Johannesburg	www.saiee.org.za
19-22	Managing Projects Effectively	CPD training Course, Johannesburg	www.saiee.org.za
27-28	Incidents Investigations Management & RCA	CPD training Course, Johannesburg	www.saiee.org.za

SEPTEMBER 2014

11	Bernard Price Memorial Lecture	Wits University, Johannesburg	www.saiee.org.za
12	Bernard Price Memorial Lecture	Bloemfontein	www.saiee.org.za
15	Bernard Price Memorial Lecture	TBC, Cape Town	www.saiee.org.za
16	Bernard Price Memorial Lecture	TBC, George	www.saiee.org.za
17	Bernard Price Memorial Lecture	TBC, Port Elizabeth	www.saiee.org.za
18	Bernard Price Memorial Lecture	TBC, KwaZulu Natal	www.saiee.org.za

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GRADE	NAME & SURNAME	CONTACT DETAILS	EMAIL ADDRESS
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Deputy President	Andre Hoffmann	011 783 9330	andreleohoffmann@gmail.com
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Past President	Rod Harker	021 553 2632	raharker@telkomsa.net
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Fellow	Viv Cohen	011 485 2567	vivcohen@telkomsa.net
Fellow	George Debbo	012 991 3748	george.debbo@gdtelecom.co.za
Fellow	Prof. Jan de Kock	018 299 1970	Jan.Dekock@nwu.ac.za
Fellow	Tom Eichbaum	011 652 2226	thomas.eichbaum@siemens.com
Fellow	Dr. Hendri Geldenhuys	084 625 5522	hendri.geldenhuys@eskom.co.za
Fellow	Sy Gourrah	087 809 4700	s.gourrah@ompetha.com
Fellow	Paul Johnson	012 428 7647	paul.johnson@sabs.co.za
Fellow	Collin Matlala	011 997 8900	matlalac@global.co.za

SAIEE COUNCIL MEMBERS

GRADE	NAME & SURNAME	CONTACT DETAILS	EMAIL ADDRESS
Fellow	Prince Moyo	011 800 4659	prince.moyo@eskom.co.za
Fellow	Prof. Jan-Harm Pretorius	011 559 3377	jhcpretorius@uj.ac.za
Fellow	Prof. Rex Van Olst	011 717 7220	Rex.VanOlst@wits.ac.za
Fellow	Dries Wolmarans	011 793 9335	dwol@mweb.co.za
Fellow	Derek Woodburn	011 609 5013	woodb1@mweb.co.za
Senior Member	Jane-Anne Buisson-Street		buisson@mweb.co.za
Senior Member	M. Chauke	012 661 2346	chaukemx@gmail.com
Senior Member	John Dal Lago	011 800 2657	John.dallago@eskom.co.za
Senior Member	Theuns Erasmus	016 960 2496	theuns.erasmus@sasol.com
Senior Member	Prof Sunil Maharaj	012 420 4636	Sunil.maharaj@up.ac.za
Senior Member	Hope Mashele	011 312 9902	hope.nga.mashele@gmail.com
Senior Member	Prof. Johan Meyer	011 559 3880	estherl@uj.ac.za
Senior Member	Patrick O'Halloran	011 490 7485	pohalloran@citypower.co.za
Senior Member	Leon Staphorst	012 841 3236	lstaphorst@csir.co.za
Senior Member	William Stucke	011 566 3009	wstucke@icasa.org.za
Member	Wayne Fisher	011 679 3481	wayne@bergmanfisher.co.za
Member	Thavenesen Govender	011 629 5738	thavenesen.govender@eskom.co.za
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Member	Dr. Nicholas West	012 656 1266	njwplasma@gmail.com
Chairman - E&S Section	Ian Gebbie	071 312 0111	Ian.Gebbie@draglobal.com
Chairperson - Power Section	Refilwe Buthelezi	011 629 5355	ButhelSR@eskom.co.za
Chairman - Historical Section	Max Clarke	011 476 5925	mppc@mweb.co.za
IEEE Representative	Prof Willie Cronje	011 717 7224	willie.cronje@wits.ac.za
RMWG Representative	Mario Kuisis	011 326 2708	mario@martec.co.za

Kwa-Zulu Natal Centre

Chairman | Veer Ramnarain

Postal Address | eThekwini Electricity | 1 Jelf Taylor Place, Durban, 4000
T| 031 311 9008 **F**| 086 693 4283 **E**| RamnarainV@elec.durban.gov.za

Western Cape Centre

Chairman | Phumelelo Ngxonono

Postal Address | Eskom, Eskom Road, Brackenfell
T|083 276 4028 **E**|phumie.ngxono@gmail.com

Southern Cape Centre

Chairman | Robbie Evans

Postal Address | P O Box 744, Wilderness, 6560
T| 044 801 2151 **E**|robbie.evans@eskom.co.za

Eastern Cape Centre

Chairman | Dawid Bester

Postal Address | 66 Havelock Street, Port Elizabeth, 6001
T|041 585 7559 **E**|dawidb@cadutoitec.co.za

Mpumalanga Centre

Chairman | Ntsika Bengu

Postal Address | PO Box 432, Secunda, 2302
T|+27 17 610 3221 **E**|ntsika.bengu@sasol.com

Bloemfontein Centre

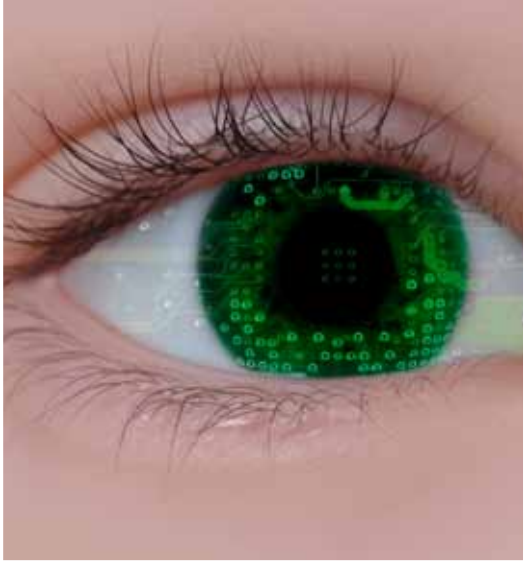
Chairman | Ben Kotze

Postal Address | Univ. of Technology Free State, Private Bag X20539, Bloemfontein, 9300
T|051 507 3088 **E**|bkotze@cut.ac.za

Vaal Centre

Chairman | Danver Jacobs

Postal Address | 38 Rembrandt Street, Sasolburg, 1947
T|016 960 5104 **E**|danver.jacobs@sasol.com



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