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wattnow magazine

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ISSN: 1991-0452

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October sees the **watt**now examining Transportation Technology, featuring two informative articles. The first, which you can find on page 30, takes an in depth look on the new BMW i-series, which is an electric car recently launched in South Africa. The second featured article, on page 36 is about the technology behind the Gautrain.

We said a sad goodbye to Mr Mervyn Emms who recently passed away. I had the privilege of meeting him at the opening of our SAIEE Museum earlier in the year. He was such a gentle soul, and will be sadly missed.

We sport a finance section on "Capturing Assets", aptly written by Coert Scherman and Attie Senekal about the eThekwini Municipality.

Since ancient times, the Sun, as primary source of light and heat sustaining life on earth, has been held in awe by cultures worldwide and given divine status. Dudley Basson writes this article, "Waves and vibes after Maxwell" for our History section which appears on page 50.

Please have a look at the new 2015 Membership fees, approved by Council. You will find the fee structure on page 48. Keep in mind that the deadline for membership fees to be paid is 1 January 2015. Council approved a deadline date of 28 February 2015 for members to qualify for the early-bird discount. In order to keep on receiving this informative publication, please pay your membership fees, so you do not miss out on what is happening at the SAIEE – your institute.

Herewith the October issue - enjoy the read.

Earn CPD Credits

*Visit www.**watt**now.co.za to answer the questions related to these articles to earn your CPD points.*

5th Annual WOMEN IN ENGINEERING CONVENTION

DATES: 26, 27, 28 November 2014 **VENUE: Gallagher Estate, Midrand**

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Chief Engineer
ESKOM GROUP TECHNOLOGY

Anita Loots
Associate Director
SKA SA

Jessica Murray
Technical Auditing Manager
SASOL SYNFUELS

Melissa Groenewald
Traffic Safety Engineer
AURECON

Vere Shaba
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WSP

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INTERNATIONAL SPEAKER/ AUTHOR AND PROFESSIONAL COACH (See inside for more details)

TOP RATED SPEAKERS

INTERNATIONAL PERSPECTIVE

LIVE VIDEO LINK

PRIORITISING YOUR WORK SCHEDULE TO IMPROVE YOUR WORK-LIFE-BALANCE
Panel Lead by:
Bonita Seaton
Deputy Ground Segment & Operations Manager
NASA GODDARD SPACE FLIGHT CENTER (USA)

CELEBRITY GUEST SPEAKER

Don't miss the charming Tumisho Masha
Actor, presenter and motivational speaker

KEY STRATEGIES TO BE DISCUSSED

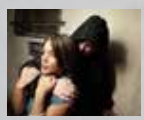
- **Playing a pivotal role as a woman engineer in South Africa's infrastructure boom**
- **How to successfully manage Mega Projects**
- **Maximising your project objectives through due diligence and contract management skills**
- **Mapping the characteristics of a true leader that sets you apart from the pack**
- **Remedying your personal skills gap through strategising your career development**
- **Monitoring the integration of young women into the engineering industry through social mentorship initiatives**
- **How women engineering minds can contribute and improve safety**
- **Being a woman in the engineering consulting world: The challenges and rewards**

CONFERENCE HIGHLIGHTS

Receive a free conference Gift Bag when you register and pay by 1 November

Join ITC in a networking Cocktail function with celebrity guest speaker Tumisho Masha

Personal Fitness and self defence session with Mark Daly – Be Prepared



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Greetings to all our Members from SAIEE House, Johannesburg.

Thank you to the Managing Editor, the Chief Executive, the Administration and the Publications Sub-Committee of Council for the "**watt**now" production. The magazine is certainly in the league of World's Best. This is excellent service to members. Your continued good work will delight, sustain and grow our membership and our collective contribution to World Class South Africa.

Thank you to our leadership at Council, the Centres and the Sections. Your nomination of the Junior Vice President and Honorary Vice President, respectively, for the 2015/2016 period, has commenced the process of election of the Office Bearers. At the October Council meeting, Council will vote in the Office Bearers for 2015/2016.

Thank you to our South African leadership for your successful hosting of the 2014 IFAC (International Federation of Automation and Control) World Congress in Cape Town. You are certainly batting successfully in the global community. You make us all proud. As fellow members of the SAIEE, we urge you to actively sustain and grow your efforts in robotics, automation and control. Well done.

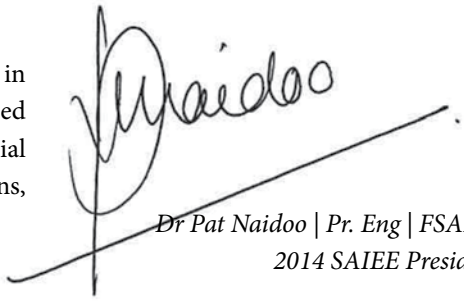
We are now at the half year mark for our annual 2014/2015 business results. At the September Council meeting, we reviewed our performance. The achievement is graded A+. Zero accident, zero incident and zero disturbance to Institute Operations. Revenues lead budget. Expenses lag budget. Membership grows steadily and we are now approaching 7000 members. Eskom directly contributes 1080 members. Our reach into and for Eskom goes from strength to strength.

Our efforts in continuing professional development intensifies. Our team has gone cross border and we hosted an event in Kinshasa, The Democratic Republic of Congo. Our Chair of the Power and Energy Section joined the twelve countries of SADC at the 43rd Southern African Power Pool meetings in Maputo, Mozambique. She shared in the discussions on regional power and energy development, security, trading and operations.

The budget for 2015/2016 is in preparation. Do collate all your planned activities and have ready your financial requirements. On annual subscriptions, we have structured the increase in membership fees in accordance with the index, CPI as at 7%. For example, a student member fee is R134.00 and a member fee is R951.00; payable by 28 February 2015. This is certainly affordable and has Council's approval.

Institute work in progress includes enhanced focus on telecommunications, on smart grid and microgrid development, on distinguished lectures, on planning for conferences, expositions and tutorials, on university student chapter and school scholar chapter development, on the road to professional registration, mentorship and coaching, on sourcing and registering of corporate partners, on national and voluntary association leadership; our list is becoming endless.

We call upon each and every member to take up active voluntary duties and demonstrate leadership at our Institute. You can make the difference; World Class South Africa can come earlier rather than later. Thank you for all the support and contributions. Keep safe and enjoy the summer rush. Holidays are on the horizon. Thank you.



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

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WATTSUP

SAIEE BERNARD PRICE MEMORIAL LECTURE

From left: Prof Bea Lacquet (Deputy Vice-Chancellor at Wits), Prof Ian Jandrell (Dean of the Faculty of Engineering and the Built environment, Wits) , Dr Pat Naidoo (2014 SAIEE President) and Ian McKechnie (SAIEE Past President).

The month of September sees the SAIEE fluff out its tail feathers and dons the party hats. The annual Bernard Price Memorial Lecture is the premier event in the calendar of the South African Institute of Electrical Engineers.

It is of general scientific or engineering interest, and is given by an invited guest, at several of the major centres in South Africa. The main lecture and refreshments was held at the University of Witwatersrand. This has proudly been its history over the past 63 years. It was also at other SAIEE centres, typically Cape Town, Durban, East London and Port Elizabeth in the space of one week.

The Lecture is named in memory of the eminent engineer Dr. Bernard Price. The first of this series of Lectures was held in 1951 and it has continued as an annual event since then.

Dr Bernard Price, (1877 – 9 July 1948) was the founding Chief Engineer and later General Manager of the Victoria Falls and Transvaal Power Company in South Africa between 1911 and 1936.

Bernard Price was born in England, in 1877 and was employed by the consulting engineers Merz & McLellan from 1901 until leaving for South Africa in 1909. He was President of the South African Institute of Electrical Engineers in 1915, and was awarded Honorary Life Membership of the SAIEE in 1940. Dr Price was a benefactor of the University of the Witwatersrand, being instrumental in the founding of the Bernard Price Institute for Paleontological Research. The SAIEE and the University of the Witwatersrand jointly host the annual Bernard Price Memorial Lecture, named in his honour.

Professor Ian Jandrell, Dean of the Faculty of Engineering and the Built environment at the University of the Witwatersrand has embarked on a nationwide tour with the SAIEE President, Dr Pat Naidoo, to deliver the highly anticipated 2014 lecture entitled *"Excitation, Ionisation and The Big Bang Theory - A Disastrous History of Lightning Research in South Africa"*.

Lightning is one to nature's most impressive events. It is captured in art, literature and music. It has been the recorded cause of damage, death and injury for as long as the human memory. It is often only thought of after a disaster… this happens to individuals and to industry, and it stimulates our need to know more. It has captured the imagination of engineers and scientists all over the world. It has spawned multinational protection industries. The topic of lightning has long provided a fertile playground for mystics, spin-doctors and catalogue salespeople.

Prof Rob Moore, Prof Barry Dwolatzky & partner.

Maureen Naidoo with Janine and André Hoffmann.

Mr & Mrs Mark Goossens.

Stan & Margaret Bridgens.

Guests from Wits.

From left: Angela Price, Roger Price, Michael Price and Ashleigh Allan.

Prof Willie Cronjé & Rika Cronjé.

André Hoffmann (Deputy SAIEE President) and Viv Crone (SAIEE Honorary Treasurer).

SAIEE President, Dr Pat Naidoo with Prof Bea Lacquet, Deputy Vice-Chancellor at Wits.

BP Lecturer, Prof Ian Jandrell with Pat Naidoo.

Craig Smith, Gerda Geyer with Wayne Fisher.

*Minx Avrabos, Managing Editor **watt**now.*

Prof Alan Clark & Mrs Clark.

2014 SAIEE President, Dr Pat Naidoo, with the son of Bernard Price, Mr Chris Price.

WATTSUP

R35-million success story for both Zambia and CONCO

CONCO CEO, Mr David van Zyl (left), shaking hands with Zambian Copperbelt Minister, the Honourable Mwenya Laban Musenge, MP.

Consolidated Power Projects (CONCO) has officially handed over the R35-million upgraded Luangwa 66/11kV substation to ZESCO Limited and the community of Kitwe on behalf of the government of the Republic of Zambia. Dignitaries present at the handover included the Ministers of Mines, Energy and Water Development, Copperbelt Provincial Ministers, members of parliament, the Mayor and deputy mayor of the City of Kitwe, the district commissioner for Kitwe, the managing director of ZESCO Limited, and other Zambian leaders and councillors.

Speaking at the handover function, the Copperbelt Minister, the Honourable Mwenya Laban Musenge, MP, stated, *"Kitwe today is witnessing a success story of one of the government's key strategic plans, which will result in employment creation and sustainable economic development through the increase in access to electricity as well as assist ZESCO improve its operational efficiency and revenue collection."*

The minister congratulated ZESCO Limited and CONCO for successfully completing the upgrade of the key power distribution substation in Kitwe. He went on to say that such investments confirm the commitment government has made in upgrading and constructing new energy infrastructure throughout Zambia. He emphasised the Zambian government's commitment to ensuring that a larger part of the population has access to electricity, stating that currently access to electricity in Zambia is about 25%, with the rural areas having less than 3% access.

CONCO opened a dedicated office in Zambia in 2010, and has since undertaken various electrical infrastructure projects in the country. In so doing, CONCO has created job opportunities for local Zambian citizens and has been instrumental in transferring skills to people in those regions. The Luangwa project, however, is the first project CONCO has undertaken with ZESCO and has been hailed as a benchmark for other infrastructure projects in the country.

Speaking at the handover, CONCO's CEO David van Zyl said, *"We are proud to announce that we are expanding our office resource in Zambia and will be moving to bigger offices in Lusaka. This will result in further job creation opportunities for the local citizens of Zambia and more so in the transfer of skills."*

David van Zyl called upon ZESCO and the government of the Republic of Zambia to take advantage of the available project relationships that CONCO has with reputable financial institutions which can be used to undertake work on projects that are critical and of high economical value to the nation. He stated that CONCO is prepared and ready to facilitate such a process in view of bringing projects to fruition.

The Honourable Mwenya Laban Musenge, MP, concluded his speech saying, *"As Government, we wish to thank ZESCO Limited and CONCO for delivering this quality Luangwa 66/11kV substation to Kitwe for the benefit of our people in all the surrounding areas of Kitwe. I wish to also thank ZESCO management for seizing this opportunity to move the corporation and the country forward."*

David van Zyl reaffirmed CONCO's commitment to working hand in hand with the government in uplifting the standards of life of the Zambian people. *"CONCO's policy is to give back to the communities wherein we operate,"* he said, *"and we are happy to report that under our community/corporate social responsibility programme, we have worked on the water reticulation system at Luangwa Clinic. It is our desire to see to it that the community of Luangwa benefits from this project."*

New Portable Appliance Testers

Fluke, represented locally by the Comtest Group, has announced the launch of its new 6200-2 and 6500-2 PAT (Portable Appliance Testers) which replace, with immediate effect, the 6200 and 6500 models. Fluke PAT testers verify the electrical safety and operation of portable appliances in accordance with relevant guidelines and regulations. With powerful auto test capabilities and simplified controls, they increase the number of tests that can be performed daily, without compromising the results.

There is a choice of either automatic or manual PAT testers and both models perform all tests required for Class I and Class II appliances. For manual testing and low volume applications, the cost-effective Fluke- 200-2 PAT model is indicated. For testing large numbers of appliances, the more powerful Fluke-6500-2 is available.

Fluke's 6200-2 and 6500-2 PAT testers are compact, lightweight, and portable.
They offer 'one-touch', pre-set and user-definable test routines from a single button to speed up test procedures and can save valuable on site time. The 'QWERTY' keyboard (or optional Fluke barcode scanner) and fast data transfer via USB flash drive, enables rapid data entry/transfer.

Vertical SMT Modular Jacks with Kapton Tape

Molex Incorporated has added Kapton tape to its family of Vertical surface mount (SMT) Modular Jacks to aid with automatic vacuum pick-and-place processes on printed circuit boards (PCBs).

Delivered in tape & reel packaging, the new options help to streamline high-volume production and lower manufacturing costs, across for instance, the telecoms, consumer, medical, industrial and commercial industries.

"We have increased the flexibility to our customers in the high-volume PCB assembly space, by adding product options that no longer rely solely on mechanical grippers for pick and place" says Kieran Wright, global product manager, integrated products division, industrial business unit, Molex. *"By adding a Kapton tape surface to the top side of the connector, Molex's Vertical SMT Modular Jacks can be picked and placed by vacuum heads; a faster, more cost-effective method, which is in line with other SMT components in the assembly process."*

Molex Vertical surface mount (SMT) Modular Jacks are fully compliant with TIA-1096-A and IEC60603-7 PL2 standards.

WATTSUP

Lightweight aluminium power transmission cables

Advanced cable manufacturer Helukabel has introduced a cost effective and lightweight aluminium power transmission cable to assist alternative power producers to cost effectively plug into the country's national power grid.

The cable is ideal for South African conditions and ticks all the boxes when it comes to reducing cost, simplifying transport requirements, ease of installation and even reducing the risk of theft that is associated with copper power transmission cables.

The new aluminium power cables are a small fraction of the cost of copper cables and offers similar performance characteristics and lifespan. Yet the cable is considerably lighter and as a result is far easier to transport and install. In certain instances the light weight of the cable may even reduce the cost of support mechanisms and cable trays.

According to Doug Gunnewegh, managing director of Helukabel South Africa, the cables also have a special finely stranded aluminium wire construction, which gives them an added measure of flexibility and makes them easier to route in confined spaces and evidently reduce labour cost and man power.

He says the cables have specially formulated heat resistant insulation and are UV and oil resistant for installation in harsh environments. To meet international sustainable development and environmental requirements the cables are also manufactured from neutral materials and contain no harmful halogen (LSZH) substances.

"Our new cables are designed to be suitable for installation on wind turbine generators, photovoltaic systems, generators, combined heat / power plants, transformer stations, as well as a wide spectrum of standard applications where cost and ease of installation are a strong consideration," says Doug.

He adds that no other additional specialised equipment is required for installations. A range of aluminium cable lugs and compression connectors are available, as well as aluminium to copper components to join the two different materials where required.

The range of Heluwind WK Powerline Alu cables are available in 0.6/1KV and 1.8/3KV variants and are designed to fill a niche for small generation plants and perfectly supplement the company's other aluminium and standard cable ranges.

New power systems expert for Aurecon

Aurecon is pleased to announce that Dr Clinton Carter-Brown has joined their Tshwane Energy Unit as a Technical Director. Carter-Brown joins Aurecon after an 18 year career with Eskom, where he was a corporate specialist in the utility provider's Technology division.

"In his role as a Technical Director at Aurecon, Carter-Brown is leading a team providing specialised technical consulting services in the areas of strategic grid planning, generation planning, generation grid integration and smart grids," says Tshwane Energy Unit Manager for Aurecon Johan Spies.

Currently, seconded to the Independent Power Producer Procurement Programme as Head of Technical, Carter-Brown is assisting the Department of Energy in the procurement of new generation capacity.

"The role involves strategic technical guidance and decision making support across a range of generation technologies, and the associated challenges in connecting new generation technologies to the Eskom and municipal networks," adds Spies.

Regarded in the industry as an expert in his field, Carter-Brown was awarded the 2012 Specialist of the Year title in Eskom's Technology group. He is the South African representative on the Cigré Study Committee C6, Distribution Systems and Dispersed Generation, taking a leading role in promoting the progress and exchange of knowledge around the subject.

As the lead author of over 15 conference and journal papers, and co-author of numerous contributions, Carter-Brown has presented at conferences locally and internationally.

African telecoms market exploding

The African telecoms market is set to be one of the main growth success stories for the telecoms sector in the next 5 years, according to a new report entitled Sub-Saharan Africa telecoms market: trends and forecasts 2013–2018 from telecoms specialist Analysys Mason.

The telecoms market in Sub-Saharan Africa (SSA) is transitioning, as growing revenue from mobile data services increasingly matches mobile voice growth.

Telecoms service revenue in the SSA market will increase at a 6% Compound Annual Growth Rate (CAGR) during 2013–2018 (mobile at 6.7% and fixed at 1.0%), jumping from USD49 billion in 2013 to more than USD65 billion in 2018.

Increased 3G coverage and capacity, and the widespread introduction of low-cost smartphones will help support the take-up of mobile data services. A related key driver is the increasing take-up of adjacent digital economy offerings – notably, mobile financial services.

According to Analysys Mason's regional analyst Mpho Moyo, *"SSA's telecoms market is growing faster than that of any other region, and will increase its share of worldwide telecoms revenue over the next 5 years, although this will still remain small compared with other regions."* The SSA market accounted for only 2.9% of worldwide telecoms revenue in 2013, increasing to 3.6% by 2018.

Telecoms revenue in SSA will continue to be heavily dominated by mobile services, which accounted for 86.5% of telecoms revenue in 2013 and will contribute an even higher 89.4% in 2018. Mobile voice and handset data revenue will together deliver 90% of the total telecoms revenue growth in the region in the next 5 years.

Access to high-speed broadband services will remain restricted to a minority of users in the region for the next 5 years. 3G connections will account for 23% of mobile (non-M2M) connections by 2018, while 4G will account for only 3%.

BP Lecture in the Southern Cape

From Left: Mario Barbolini (Honorary Vice President), Paul van Niekerk (Past President), Liz van Niekerk, Prof Ian Jandrell (BP Lecturer), Dr Pat Naidoo (2014 SAIEE President), Cassidy de Wet, Gus Gregory, Marie Davison (Past President) with Robbie Evans, Southern Cape Centre Chairman in the front.

The Bernard Price Memorial Lecture tour visited the Southern Cape on 16th September, and turned out to be a very special occasion. Our President, Pat Naidoo, introduced the speaker, with a brief background sketch to the memory of Bernard Price and some of his greatest achievements.

Prof Ian Jandrell's presentation on lightning was excellent, fully meeting the high expectations of the annual BP Lecture series. An appreciative audience gave enthusiastic applause at the end of the talk, which was well supported by his visual material.

It was notable that attendance included our President, Pat Naidoo, Past Presidents Marie Davison and Paul van Niekerk, as well as Honorary Vice-Presidents Mario Barbolini and Neel Smuts.

WATTSUP

Automated valves provide infinite control for industrial processes

Jerry Smits, national sales manager of Protea Automation

Automation specialist, Protea Automation Solutions, has raised the bar in the control valve industry with the introduction of a sleek new range of Italian-made valves for process and industrial applications.

The valves, manufactured by well-known and respected valve manufacturers, M&M International, are a well priced alternative to existing brands available in South Africa and offer European-quality assured performance and durability, while full support and service is afforded by Protea Automation Solutions.

According to Protea Automation Solutions national sales manager, Jerry Smits, the range of advanced solenoid and piston actuated valves perfectly complements the company's popular range of Ashcroft pressure gauges, transmitters and switches, as well as its Fairchild range of pressure regulators, volume boosters and I to P converters.

"This completes our pneumatics and process control equipment offering and ensures that designers, engineers and plant owners have a single-source of supply for control equipment. They can rest assured that we have carefully chosen an agency with products that best suits the needs of our southern African customers.

"M&M International is a leader in the supply of solenoid and piston actuated valves throughout Europe. In South Africa they have been made keenly aware of the need to pitch prices competitively and as a result have committed to supply top-quality products at an affordable price," says Jerry.

He continues that the range is widely used in a variety of industries worldwide, including the food, agriculture, energy, railways, industrial automation and automotive industries (among others). The valves are suitable for a all-manner of materials from gasses to fuels, liquids, steam, powders, etc.

Aberdare's Submersible Pump Cable

Submersible pumps require electric cable that is suitable for use in underwater applications. The cable must be flexible, robust and be able to prevent any ingress of water or contaminants entering the cable via the sheath.

Aberdare Cables, a Powertech company, manufactures submersible pump cable that provides power supply to mobile and portable submersible pumps such as those used in quarries, farms, cleaning and sewerage extraction plants, dewatering applications and boreholes.

The cable comprises high conductivity bunched flexible copper conductors to SANS 1411 Part 1. The cores are insulated and bedded with flexible grade waterproof PVC to SANS 1411 Part 2. Final protection is provided by a flexible PVC outer sheath.

Available in various sizes, the submersible pump cable is supplied in three-core and four-core options. Cable core configurations are easily determined as Aberdare uses green as a sheath colour on four-core cables and blue for three-core cables.

Meeting SANS 1574 requirements, the cable has a -10 to 70°C operating temperature range, a 600/1000V rating and is available in 500 m wooden drums. It is recommended that for special applications of submersible pumps, the manufacturer is consulted to ensure correct application.

IN MEMORIAM

Mervyn Emms

We are very sad to announce the passing of Mervyn Emms at the age of 90 on 9 September 2014.

BY | DIRK VERMEULEN | FSAIEE

1924 - 2014

Mervyn was elected as a Companion of the SAIEE in July 1962 and was the last surviving foundation member of our Historical Interest Group (now the Historical Section (HS) of the SAIEE) but he was best known as a compulsive collector of unusual artefacts.

He started life in Cape Town and while still at school began collecting, amongst other things, obsolete telephones scrapped by the SA Post Office (SAPO).

After matriculating he started his career with SAPO as a telephone technician. In the early 1970s the Post Office staged an exhibition of their communication services featuring Mervyn's telephone collection.

To perpetuate this effective promotion, management decided to create a Post Office museum in the basement of their new head office in Vermeulen Street, Pretoria. Mervyn's telephones provided the core displays and he was appointed as curator.

When the Post Office museum was closed in 1984 Mervyn retired from the Post Office and concentrated on his passion for collecting. His house in Pretoria became a 'cabinet of curiosities' and was soon filled by around 20 000 artefacts and 4500 publications. Every week he attracted over 30 visitors who came to enjoy his guided tours through his remarkable collection. Mervyn also published numerous hand written articles delivered in his very legible italic script without any help from a word processor.

During 1980, the SAIEE put together a team to collect and preserve electrical artefacts and literature. Mervyn's expertise was recognised and he was invited to join our Historical Interest Group (HIG). His experience guided our progress throughout its early years.

Mervyn frequently invited the HIG to hold its meetings at his home where we were always welcomed by Elsmarie with her scrumptious teas and lunches and by Mervyn with his bottomless pub.

He donated a large number of items to the HS and these are now showcased in the SAIEE museum. In the last 10 months, he has made his remarkable collection of nearly 200 telephones available to us and these now form the first of our museum displays in Innes House. One of his last wishes was that these telephones should be donated to us. In recognition of his valuable contributions we have named this first of our museum venues the 'Mervyn Emms Room'.

Mervyn has made a huge contribution to the SAIEE's commitment to the preservation of the history of electrical engineering as well as to other branches of science and technology. We hope that his enormous collection of 20 000 historical artifacts will be preserved for posterity.

We offer our sympathy to his wife Eileen, his children Susan, Anthony and Nicholas and his granddaughters Ashley and Megan. We would particularly like to include his close friend and neighbour, Elsmarie Wellman whose invaluable assistance in documenting and recording every item on display and her sterling support made it possible for Mervyn to concentrate on his accumulating passion.

Mervyn will always be remembered by the artifacts he has collected. wn

China component suppliers enter Southern Africa's CSP market

China Prices Department of National Development and Reform Commission (NDRC) have recently approved the Feed-in Tariff (FiT) of RMB1.2/kWh for SUPCONSOLAR Delingha 50MW Tower Concentrated Solar Power (CSP) Project. Its Phase One 10MW project was in operation and connected to the grid in July last year. SUPCON is the first CSP developer in China getting approved FiT.

The launching of tariff policy is no doubt great news for CSP industry players both in China and abroad, and after a decade of development and exploration, most of the key components are being manufactured in China. Leading manufacturers based in China are interested in entering the South Africa market and are therefore joining the upcoming CSP Focus South Africa 2014 event scheduled for 6 and 7 November in Cape Town.

In South Africa, four parabolic trough projects (totalling 350 MW) and one tower project (50 MW) has been approved under the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP), and two other project (100 MW for each) in Window 3.5 will be announced soon. Moreover, developers like Eskom, Afri-Devo & Ample Solar, BrightSource Energy are planning over 500 MW projects. This will generate a high demand in Chinese-manufactured components which are cheaper and of high quality. This will contribute towards cost reduction of CSP in South Africa.

Besides the "Chinese-manufactured" element, hot topics will be shared and discussed during the two day conference of CSP Focus South Africa, including project experience & lessons, cutting-edge innovations, key challenges analysis, cost reduction solutions, new applications—hybridization plants, solar cooling & mining, potential business opportunities and latest updates on REIPPP Window 3.5 bidding results and CSP allocation in IRP.

CSP Focus South Africa 2014 will showcase the top South African and international CSP experts, from companies such as South Africa Department of Trade and Industry, Abengoa Solar, BrightSource Energy, Afri-Devo, Ample Solar, Aveng Steel, Abener, IDC, Absa, Eskom, Mott MacDonald, Schott Solar, GeoSun Africa, Stellenbosch University and many more. More than 120 policy regulators, CSP developers and EPCs (EU, USA, local), financiers, system integrators, component and service suppliers, technical and industry experts are expected to join this grand gathering for South Africa's CSP sector.

For more information about the conference visit www.szwgroup.com/csp or contact Ms. Ella Wei on csp@szwgroup.com.

No electricity bill, no grid connection

Schneider Electric, a specialist in energy management, showcased its off-grid solar streetlighting solutions at its Xperience Efficiency event, held for the first time in South Africa during August 2014.

The organisation emphasised that streetlighting is a need in the southern African environment to increase the safety of both its pedestrians and vehicles, and to support nightly social and economic activities. *"It is a much more cost-effective means to light up a city's monuments and other places of interest,"* says James Shirley, business leader for the Schneider Electric's Solar Business in southern Africa.

He says that the challenges of a grid-connected solution include strong energy consumption due to old and defective materials, resulting in high electricity bills. In addition, an uneven grid and too much pressure on a grid result in no access to streetlighting or load-shedding.

"Solar public lighting is booming in new and sunny economies. Eco friendly, it promises electricity and cable free operation for residential complexes, industrial perimeter lighting and public road and area lighting. Last but not least it is often the more efficient way for bringing security and development to numerous people living off-grid," adds Shirley.

"Unfortunately, the current issues associated with solar lighting include no maintenance, vandalism, poor lighting and oversizing."

He highlights that these issues were taken into consideration and its research and development team created innovative components with a system based approach especially for the southern African geographic and socio-economic landscape. *"As such, we offer an energy management streetlighting system that ensures the protection of the battery, provides intelligent lighting management and enhances the battery life,"* he explains.

Schneider Electric's NiMH battery also provides extreme resistance to heat, exceptional cycling capacity and an expected lifespan of 10 years, far longer than the general one to two years promised by other solar products currently on the market. The organisation's LED light engine also has a high efficiency output of 152 lumens/ watt and offer high reliability of IP 67 and IK 08. Added functions are its motion sensors.

"As plug and play products, the installation is really easy and takes only few minutes. The smart energy management system guarantees no blackout, even during cloudy periods," he adds.

Increased services to local businesses with new integrated ERP division

ITNA launched its integrated Enterprise Resource Planning (ERP) division recently to provide holistic resource planning solutions to local businesses. ERP is a business process management (BPM) software that allows businesses to use a system of integrated applications to collect, store, manage and interpret data from business activities. This means companies can integrate and automate their operational functions, leading to reduced overheads and much quicker turnaround on these processes.

"ITNA has now over 20 years of account and ERP experience, for this reason we are strongly positioned to offer support on businesses' existing systems, as well as consulting and deployment of new solutions," says Anton Richter, Head – ERP Division.

"Our services include: business process analysis, specification of solutions (as well as specification of third-party software), implementation, training and support."

ITNA's ERP division will service businesses of all shares and sizes and provide custom-made solutions to larger players and both small and medium-sized enterprises.

"Operating in ICT infrastructure for over two decades, ITNA understands the importance of applications running on reliable IT infrastructure. We are now able to support both applications and infrastructure. This means that you can now cut out all of the unnecessary middlemen and have one single point of contact, which is committed to servicing all of your IT needs," concludes Cobus Kirkpatrick Managing Director of ITNA.

Africa Energy Indaba 2015 Agenda Cuts To The Heart Of Africa's Energy Future

The global energy landscape is constantly changing as energy becomes a scarcer, more expensive commodity and the world becomes smaller and more environmentally conscious. Events that bring together global and national energy leaders have a responsibility to set programmes that will cut through superficial agendas that turn out to be mere talk-shops and bring stakeholders together to find strategic and tangible solutions for Africa's energy requirements.

Unlike other events that call for conference papers and speakers, the programme of the annual Africa Energy Indaba is set by an international steering committee, which boasts members from the World Energy Council (WEC), the South African National Energy Association (SANEA), the NEPAD Planning & Coordinating Agency (NPCA), government representatives and industry leaders from various energy sectors such as the oil, gas and renewables sectors.

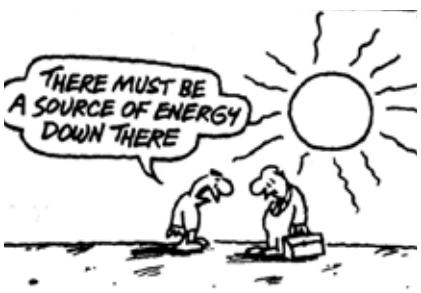
The annual Africa Energy Indaba (AEI) is not just another energy event organised by an event company that knows little about the energy sector, every detail of the event is directed by the elected panel of energy experts, which meets throughout the year to plan the topics that will be debated at the annual Johannesburg conference.

Adopted by the World Energy Council as their African regional event, AEI receives global recognition as the foremost African event for energy professionals from across the globe. Presented by SANEA in association with WEC, and supported by the African Union and the NPCA, the forum has achieved the highest level of endorsement and support of any energy event on the continent.

"We are exceptionally proud of our steering committee model, which has given our event the credibility and reputation it has achieved. With representation from the WEC, SANEA and the NPCA for the 2015 event, we are looking forward to greater African representation and increased delegate numbers at our February 2015 conference and exhibition," says Liz Hart, Managing Director of Siyenza, the organisers of the event.

The topics for the 2015 event are not merely a repackaging of the previous years' topics, but are cutting edge and exploratory topics that are particularly important to the African context. The issues of energy efficiency technologies of the future, Africa's low carbon development, the next frontiers of energy growth on the continent, geothermal energy and the realisation of gas potential in Sub-Saharan Africa are all topic examples that are currently being grappled with by Africa's energy industry players.

The two-day Energy Indaba will be held from the 17th – 18th February 2015 at the Sandton Convention Centre in Johannesburg, South Africa. A number of side events will run alongside the conference and exhibition, which include the World Energy Council's invitation-only Global Energy Leaders' Dialogue, a Women in Energy Forum, an IPP & PPA workshop, an Electricity Theft session and an Energy Efficiency workshop.



The Cape Town Science Centre was established under the leadership of Professor Mike Bruton in 2000. It is the only interactive, 'hands-on' science centre in Cape Town that is dedicated to the public understanding and education of science and technology for both young and old. It serves both the informal and formal educations sectors through its many activities, which includes a significant outreach programme utilizing a mobile van that travels across the Western Cape.

The Science Centre moved to a new home in Observatory towards the end of 2011, which is now far more accessible to all communities in Cape Town.

SAIEE has over a two year period made it possible for nearly 800 learners and 25 teachers to visit the Cape Town Science Centre for inspiring, curriculum based school group visits. One of the main objectives of these visits to the Science Centre was to raise awareness of electrical engineering, to stimulate an interest and inspire learners to pursue careers in the electrical engineering field.

A key activity of these visits and by far the most enjoyable if not most challenging, was a workshop where learner built an electric motor. The learners really enjoyed the opportunity "to build something in class". Other activities of their three-hour visit included a tour of the Camera Obscura, a giant

SAIEE help learners get 'switched on'

Fly a rocket to the moon, build a house using foam bricks and cement, take a whirl on the gyroscope as you train to be an astronaut…..At the Cape Town Science Centre mind-sets are shifted as learners and teachers are delighted, inspired and excited about the connection between science and life. Often, for the first time they see the relevance of science in their daily life and are eager to explore it further.

walk-in camera giving 360 degree view of the surrounding areas, free time to enjoy the many hands-on exhibits on the Main Exhibition Floor and of course a taste of one of the Science Centre's famous science shows.

Electrical Engineering students from the French South African Institute of Technology (F'SATI) who are currently studying at Cape Peninsula University of Technology (CPUT) took time out of their schedules to spend several mornings with these learners. The discussions with the learners were informal and relaxed in order to engage the learners in discussion and encourage questions.

The selections of schools to benefit from this intervention were chosen in conjunction with SAIEE and the Western Cape Education Department (WCED). All these schools are from under privileged areas and if it were not for organisations such as SAIEE, many of these learners would never have a visit to the Science Centre for an enriching excursion.

Larry Khuvulu from SAIEE and the driving force behind these visits credits his decision to study electrical engineering as a young scholar, to the time he spent in a science centre in his youth in Limpopo. Larry recognises that "while classroom education is a priority, the learning experience should not stop there". It is widely recognised that keeping our learners engaged, stimulated and curious is what makes for a successful school career with good subject choices and eventually good career choices. Indeed, international studies show that a visit to a science centre make learners more receptive to teaching in the classroom. Further, in the latest research by John Falk and Lynn Dierking it has been found that "a very high percentage of learning takes place outside of the classroom. A growing body of evidence supports the contention that the public learns science in settings and situations outside of school."

The Cape Town Science Centre (CTSC) operates as a social enterprise, under the auspices of the Interactive Science Foundation NPC (RF), a registered Non-Profit Organisation (031-701-NPO), registered as a Public Benefit Organisation in terms of Section 18A of the Income Tax Act of South Africa (PBO: 18/11/12/2663).

The Science Centre is extremely grateful to the SAIEE for their support, which makes it possible for the Science Centre to deliver on its mission of not only inspiring learners but also supporting the teaching taking place in the classroom. wn

Save Fuel, Save Money, Save Lives

As fleet owners batten down the hatches in South Africa's increasingly tumultuous economic environment, effective management of costs become a focal point.

The incidence of truck accidents on South African roads have however made headlines in recent months leaving many fleet managers concerned about driver safety and in particular, reducing preventable accident rates and associated repair, downtime and liability costs.

"Driver safety is of huge concern," says John Edmeston, CEO of Cartrack. *"Safety on our roads is important and I would like to urge fleet owners to seriously consider various tools that are available to them to address the issue. An 18-wheeler truck is a potential weapon of mass destruction in the wrong hands and we need to not only hold the driver accountable for their actions, but also motorists who drive recklessly. Unless we are prepared to collectively take ownership of our actions, the current situation on our roads will not improve,"* says John.

In answer, Cartrack is launching Drive Vision that firmly places the spotlight on safety by means of on-board audio and visual equipment that is paired with Cartrack's comprehensive telematics technology. It effectively takes fleet management to the next level, allowing fleet managers to take a virtual ride with their drivers.

The information that is derived from Drive Vision combines vehicle driver behaviour data and video event recording technology to provide a bird's eye view of any event that may occur, whether it is an incident of harsh braking or a serious accident. *"The information may well prove to be invaluable in establishing the cause of accidents by accurately reconstructing events as they happened,"* explains John.

Drive Vision is a comprehensive dual camera system that works in conjunction with a competent driving performance program. The on-board visual equipment comprises a primary camera that records video footage with a 120 degree exterior view of the road ahead of the vehicle plus a secondary driver camera that provides a 160 degree view of the vehicle cab with infrared illumination for low light conditions. This is combined with a microphone that records an audio channel that accompanies the visual footage.

The camera system has a built in accelerometer which records events such as speeding, harsh braking and harsh acceleration, among others. When an event is triggered, a trained administrator in the data review centre will review the footage and produce a comprehensive analysis of the event with a driver counselling report.

"The footage spells out exactly what actions led to the event, how it was handled and what the outcome was. It is an invaluable tool for organisations and will greatly

assist in risk management efforts and be of great benefit to both the driver and the company," explains John.

"Drive Vision ultimately translates into predictable and sustainable reductions of a fleet's operational costs, especially as far as savings on fuel and maintenance are concerned. Central to that, Drive Vision also provides the means for fleet owners to gain unprecedented collision and damage frequency reductions, which is something that is sorely needed on South African roads," concludes John. wn

John Edmeston
CEO | Cartrack

Solar Capital De Aar Solar Farm, Largest In The Southern Hemisphere

De Aar solar farm now provides electricity to over 35,000 South African homes. This Project, during its lifetime, will show a carbon footprint saving for South Africa of c. 3,000,000 tons.

Should one be travelling by air over the small rural town of De Aar in the Northern Cape when flying from Johannesburg to Cape Town, you will likely see a massive expanse of what appears to be dark glass mirrors. This extraordinary array is the Solar Capital De Aar solar farm which covers an area of 274Hectares (nearly 40 football fields).

This facility is currently the largest solar farm in the Southern Hemisphere and was connected to the Eskom grid recently. It now provides electricity to over 35,000 South African homes.

This arid area of our country is not just productive in providing renewable energy but employed at peak of over 2000 people; over 90% of them from the De Aar locality. A further 55 locals will remain employed, for operation and maintenance services, for the duration of the Project which extends to 20 years. The facility cost R2.5 billion and was funded by Standard Bank of South Africa. Solar Capital has a twenty-year Power Purchase Agreement, valued at over 12 Billion rand with Eskom to generate and supply power on a daily basis to the electricity grid.

The Government of South Africa, through the Department of Energy, and its Renewable Energy Independent Power Producers Program (REIPPP) team have developed a remarkable program in the combining of Social and Economic Development Programs for these areas to the Renewable Energy solution of the energy deficit currently affecting our country. In 2012, South Africa recorded the world's highest growth in renewable energy investment, with 5,7 Billion rand invested, according to the UN Environment Program. This surge in investment, led largely by solar power projects, comes as South Africa moves to reduce its dependence on fossil fuel based coal, resulting in a high environmental toll, which currently accounts for around 86 percent of the country's energy. To achieve this, the South African Department of Energy has set the ambitious target of generating 18 GW of 'clean' energy by 2030. Renewable energy accounted for less than one percent of the energy mix in South Africa in 2012: it is expected to reach 12 percent in 2020. This South African inspiration will drive investments in large-scale solar power projects that will transform the African continent, where rising populations and six of the world's 10 fastest-growing economies have resulted in ever growing energy deficits.

The Solar Capital template for growth is to develop the entire integrated chain from suitable and viable site identification; environmental and further approvals and consents that are necessary to have future solar farms 'build ready' for solar power generation installations, the planning of grid connections and design of appropriate solar energy solutions. Furthermore, Solar Capital has the existing network and capability to identify financial partners and source investment and debt funding both locally and internationally. Once this entire project solution has been completed, Solar Capital is then positioned to bid their projects in the open and highly acclaimed, competitive Department of Energy tender process.

Currently Solar Capital has 27 solar farms 'build ready' in the Northern Cape, where solar irradiation is recorded as being some of the highest in the world and can be most efficiently converted to electricity. These farms can accommodate installations totalling over 2,000 MW.

Solar Capital seeks to maintain long term ownership of 30% shareholding in their developments and build strategically beneficial partnerships with the local entities and stakeholders through a Community Trust, together with Black Empowerment entities and select investors. This current project has, as investors, the De Aar Community, BEE, and Public Investment Corporation on behalf of the Government Employee Pension Fund, alongside Solar Capital.

Solar Capital's CEO, Albert Lennon, commented that *"this recently completed Solar Capital De Aar facility is just the start, being phase one of the 400 MW mega solar farm planned for the De Aar area with a projected investment of over 8 Billion rand. The second phase of 90 MW is currently under construction. Our core vision is to be a world leader in the market for the provision of low-cost solar energy".*

The REIPPP encourages participants to participate in the upliftment of communities particularly within a 50-kilometer radius.

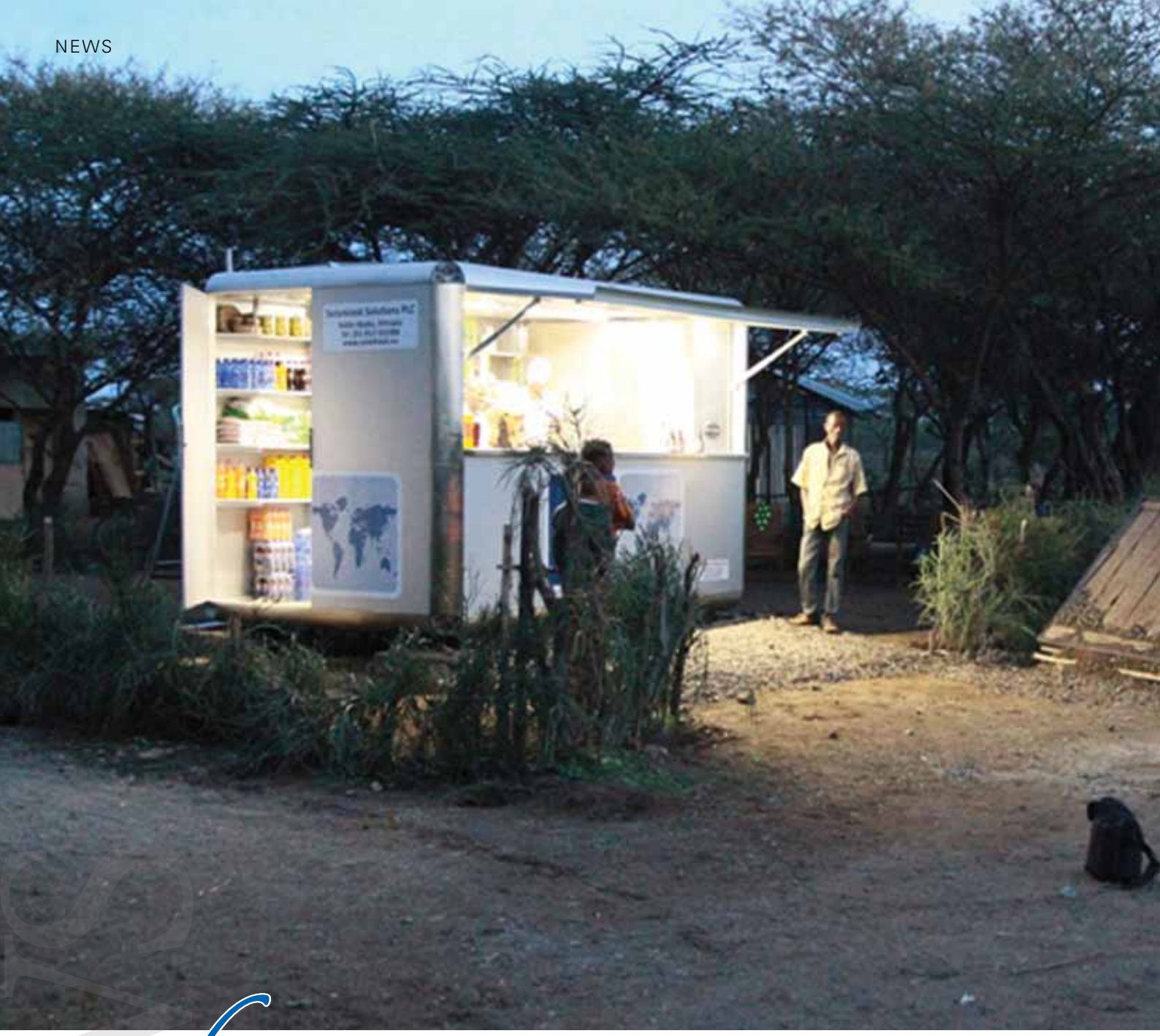
Lennon further commented that *"the Solar Capital project will contribute over 300 Million rand to the locality and community, in direct grants, over the lifetime of the project to facilitate social and economic development. Additionally the De Aar Community Trust will collect 420 Million rand in net dividends from the Project to spend on local community initiatives".*

Janice Finlay, the Head of Social and Economic Development confirmed that Solar Capital had spent over 15 Million rand in the past year in De Aar, with a new 40 bedroom hotel, the acquisition and development of a new Industrial Estate, and a cash grant to the FARR (Foundation for Alcohol Related Research) community project. Their latest initiative which goes live in the coming weeks is free WiFi for De Aar which will also include the presentation of electronic 'tablet' devices to the local schools for the education of the pupils and their competency in the digital age.

Solar Capital Founder and President Paschal Phelan commented that *"this inspired program by the Department of Energy provides all the key ingredients for successful private sector development in South Africa, highly competitive energy cost, at a time of shortage; significant job and development opportunities, in a seriously disadvantaged rural area; private sector investment and know how in localized social and economic development".*

He further added *"the latest cost of solar energy is significantly below that of new coal power station energy.*

Solar takes 10% of the time to install; uses a tiny fraction of the water with no pollution or carbon footprint; and importantly, they are fully funded by the private sector". wn



Gemalto, the world leader in digital security, is providing M2M connectivity for SOLARKIOSK, a compact, solar powered station transported onboard a mobile vehicle. This cabin features photovoltaic panels across its roof to generate sustainable energy in areas outside of conventional power cabling and infrastructures. Gemalto's Cinterion® modules deliver rugged M2M connectivity powering a mobile router, provided by INSYS icom, which enables condition monitoring of the SOLARKIOSKs' photovoltaic panels and tracks energy production and consumption through a web interface.

Quick and easy to deploy, the SOLARKIOSKs support simple plug-in access for appliances, devices and broad range of systems. Each kiosk generates enough electricity to operate the cellular router and recharge 220 cell phones in a single day – up to 80 at the same time.

The M2M solution provided by Gemalto and INSYS icom monitors and manages the solar panels on a 24/7 basis, tracking energy input and output, providing a reliable system for power delivery to end users, and automatically reporting potential problems.

Connectivity solution helps deliver green energy to remote communities without electricity

Transforming the lives of millions of people who live in the rural areas of Africa

The SOLARKIOSKs produce sustainable electricity for a variety of services, including refrigerated storage for medicines as well as for consumer products. By delivering these benefits to remote communities, the SOLARKIOSKs are expected to transform the lives of millions of people who live in the rural areas of developing countries.

Projects are already operating in Ethiopia, Botswana and Kenya, supplying both power and access to information, in particular for education and creating a social hub for local communities.

"One of the biggest challenges for M2M communication is to properly function in extreme environments such as the intense heat of an African desert or the tremendous moisture of a South American rainforest," said Michael Gartz, Director Sales and Marketing for INSYS icom.

"INSYS icom and Gemalto heavy duty technologies are ideally suited for those areas which are not connected to an electricity grid, such as rural and remote areas in developing countries and districts affected by disasters. An estimated 1.5 billion people worldwide live in such regions, with 600 million in Africa alone and SOLARKIOSK will be there to serve them."

"In many parts of the world, traditional power infrastructures are difficult to set up and quickly become expensive to maintain," added Thomas Steffen, M2M regional manager at Gemalto.

"With SOLARKIOSK, we aspire to play a social role in meeting such Machine-for-Human challenges, whatever the geographical constraints." wn

Bionics takes flight in South Africa

For the first time in South Africa, two revolutionary bionic innovations were on display in Cape Town; the Festo SmartBird and BionicOpter.

These were sponsored by Festo Germany for the 19th World Congress of the International Federation of Automatic Control (IFAC) taking place at the Cape Town International Convention Centre.

These innovations form part of the Bionic Learning Network, led by Festo, to take inspiration from nature and create engineered replicas. Dr Heinrich Frontzek, Head of Corporate Communication, from Festo AG & Co. KG was in Cape Town to present at the IFAC congress on the reasoning behind the Bionic Learning Network.

"The goal of the network is to motivate, inspire and to kick-start innovation" explains Frontzek. Through his presentation Frontzek demonstrated how using nature as inspiration leads them to more sustainable automation solutions and ways to make it more people-friendly. *"Animals have efficient designs for energy and exchange information on where to find food for the advantage of all"* says Frontzek, *"we try to replicate that with automation for the benefit of all."* The network consists of Festo specialists, universities, students and inventors.

Dr Frontzek showed the strides made through various bionic innovations from the Bionic Learning Network, including the two on display at the Congress. With the SmartBird, Festo has managed to replicate the wing motion of a Herring Gull in a robotic form, showing the possibilities for energy efficiency through automated robotics. Taking this initial breakthrough further, in 2013 the Bionic Learning Network presented the BionicOpter, another flying robot based on the dragonfly.

Each wing moves independently, allowing it to slow down, accelerate quickly, make sharp turns and fly backwards. The BionicOpter's motion has been automated to the point that it can be controlled via a smartphone app.

From left: Frieder Ruhstorfer (Bionics pilot), Dr. Ing, Heinrich Frontzek (Head of Corporate Communication, Festo Ag & Co KG), Markus Schäfer (Bionics Pilot).

Not only are the innovations producing products for industry and inspiration for new developments, the materials used in their production, are similarly at the forefront of technology. Laser sintering was used to generate the prototypes as you can generate a new prototype easily and test it. Furthermore, the polyamide material is very lightweight.

"From these bionics, we learn new approaches for automation. More functions integrated into smaller spaces and components are getting smarter" concludes Frontzek.

Smartbird flies at the University of Cape Town Campus.

World Robot Olympiad South Africa

The World Robot Olympiad (WRO) is a global robotics competition that brings together young people from all over the world to develop their creativity, design & problem solving skills through challenging & educational robot competitions. The World Robot Olympiad competition utilizes LEGO Mindstorms manufactured by LEGO Education.

The theme for this year's competition was "Robots in Space". In the regular category, children have to design, build and program a robot to solve a prescribed task.

The open category design had to build and program a robot, using LEGO Mindstorms controllers and each team had to present their project to a team of judges.

To qualify for the international tournament, countries held Regional and National Competitions. Winning teams at the national competition in the specific age groups, are invited to participate in the international WRO. This year the competition will take place in Sochi, Russia from the 21 – 23 November. Teams will be competing against the best in the world.

The National competition this year was closely fought, especially in the regular categories.
The category winners were as follows:

REGULAR CATEGORY
PRIMARY SCHOOL

GOLD: GPS Minions : I-SET
Team: Keegan McKenna, Jayden Wills, Johnathan Robinson

SILVER: Siyakha : I-SET
Team: Moedi Motlokoane, Ompheile Rakgotla, Monde Zwane

BRONZE: Techno Apies
Team: Cydney Williams and Jamie de Vries

JUNIOR HIGH SCHOOL

GOLD: CTR+C: Deutsche Schule, Pta
Team: James Kim & Thomas Kabutz.

SILVER: Marabots: Maragon Pvt School - Olympus.
Team: Christian Steyn & Edrich Engelbrecht.

BRONZE: Crushers: Technokidz
Team: Ruan Potgieter, Coenraad Kuipers & Derick Swanepoel.

SENIOR HIGH SCHOOL

GOLD: Watch this space : Waterkloof
Team: Bernard Smit, Ulrik de Muelenaere & Hendri du Toit.

OPEN CATEGORY
JUNIOR HIGH SCHOOL

GOLD: Space Invaders & Delta 3: Independent
Team: Jared Rheeders, Reuben Pretorius & Matthew Whyte.

SENIOR HIGH SCHOOL

GOLD: Siyakha Evolution : I-SET
Team: Bonolo Seakamela & Kgopotso Sebidi.

GEN II FOOTBALL

GOLD: T²H : Deutsche Schule Pta
Team: Heiko Kabutz & Thomas Hettasch.

SILVER - The Demaskes : Deutsche Schule Pretoria
Team: Tobais Demaske & Heiko Demaske. wn

Jared Rheeders, Reuben Pretorius, Matthew Whyte.

Bonolo Seakamela & Kgopotso Sebidi

Keegan McKenna, Jayden Wills & Johnathan Robinson

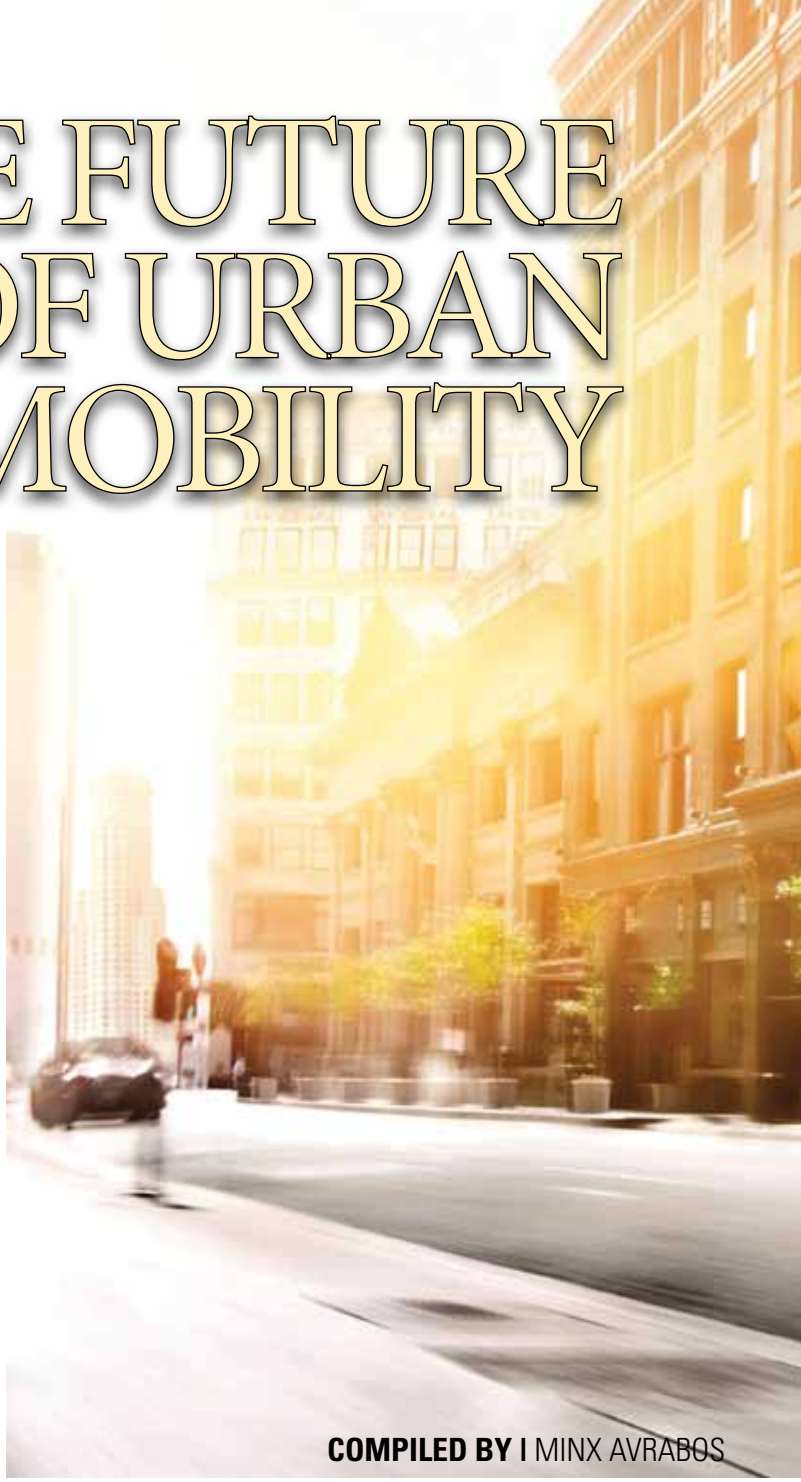
James Kim & Thomas Kabutz

Bernard Smit & Ulrik de Muelenaere

Earn CPD Credits

THE FUTURE OF URBAN MOBILITY

The BMW i-series is a comprehensive and ground breaking concept for sustainable mobility. It represents visionary electric vehicles and mobility services, inspiring design and a new understanding of premium that is strongly defined by sustainability. And it thrills with its innovative vehicles: the all-electric BMW i3, a locally emission-free vehicle for city driving that is sustainably designed throughout, and the BMW i8 concept as the future of the sports vehicle.



COMPILED BY | MINX AVRABOS

BMW i is revolutionising automotive engineering with the first series-produced passenger cell made of carbon, a component from BMW EfficientDynamics lightweight con-struction technology. Carbon is around 50 % lighter than steel and around 30 % lighter than aluminium, allowing BMW i to set new standards in lightweight construction while also completely offsetting the additional weight resulting from the high-voltage lithium-ion battery. At the same time, carbon is a high-tensile material with very versatile applications in construction that increases the safety of all passengers. BMW i is all about visionary electric vehicles and mobility services, inspiring design and a new understanding of premium that is strongly defined by sustainability and pursues a holistic approach. BMW i is redefining the understanding of personal mobility with purpose-built car concepts, a focus on sustainability throughout the entire value chain and a whole host of complementary mobility services.

LIFEDRIVE ARCHITECTURE

BMW LifeDrive is the first architecture to be custom-built for

electric cars. It is made up of two separate units: the Life module, the passenger cell made of carbon, and the Drive module with suspension and drive components and the high-voltage battery. The advantage? By securely housing all drive components in the lower module, there is no tunnel running through the middle of the car, thus leaving more room for passengers. The LifeDrive architecture not only compensates for the extra weight of the battery, it also lowers the car's centre of gravity, giving every BMW i the kind of agility you've grown to expect from BMW.

CARBON FIBRE

The passenger compartment of the BMW i3, the so-called Life module, is completely made of carbon (also known as 'carbon fibre reinforced plastic' or CFRP) – an especially light and high-strength material that provides outstanding protection to vehicle passengers in the event of an emergency. Until now, the manufacture and use of this material for large series production of the vehicle was too difficult. But after 10 years of intensive research and experience in the manufacturing of parts, the BMW Group has developed an innovative solution and now produces carbon fibres and carbon fibre plates in large series together in a joint venture with the company SGL Automotive Carbon Fibers.

The future of Urban Mobility

continues from page 31

LITHIUM-ION HIGH-VOLTAGE BATTERY

The lithium-ion high-voltage battery is positioned centrally in the Drive module of the BMW i3 and thus optimally protected against outside influences. A specially developed heating and air conditioning system ensures as little temperature fluctuations as possible, which significantly increases the service life of the high-voltage battery.

The Battery Guard supports the BMW i3 owner by monitoring the high-voltage battery of the vehicle and notifying the owner, for example, if a deviation from the planned charging procedure occurs or, for example, if the vehicle lights were left on for too long.

The high-voltage battery is guaranteed for eight years or 100,000 km.*
**for 70 % of the charging capacity*

AERODYNAMICS

Minimum wind resistance, maximum range: excellent aerodynamics are a key element of efficient electromobility. With BMW i, fully concealed underbodies prevent wind turbulence under the car, while aero-flaps improve the aerodynamics of the wheel arches and side sills behind the front wheels. This reduces wind resistance and the car's energy consumption, extending the range.

Natural, renewable, and sustainable: the interiors of BMW i cars feature door trim panels and dashboards made from a renewable natural fibre, naturally-tanned leather and an open-pore eucalyptus wood from 100 % FSC®-certified forestry. Overall, 25 % renewable raw materials and recycled plastics were used in the interior of the BMW i3. The textile seat coverings are 100 % recycled polyester, produced using 34 % PET. A further 25 % recycled plastics are used in the exterior.

BMW eDRIVE

Three key features deliver an unequalled emission-free driving experience: the entire torque of the extremely agile electric motor is available virtually from a standing start, and uninterrupted acceleration is maintained up to the maximum speed. Innovative battery technology combines the ultra-powerful high-voltage battery with a cooling system that keeps the battery at the ideal operating temperature and boosts its performance and lifetime.

The intelligent energy management system coordinates optimal interaction between the electric motor and the high-voltage battery with the goal of maximum performance with minimum consumption. Regenerative braking mediated by one-pedal driving extends the car's range. Together with the ECO PRO modes, the push of a button is all it takes to gear all car systems towards maximum efficiency – and utilise energy reserves intelligently.

ELECTRIC MOTOR

The electric motor of the BMW i3 was designed for use in city traffic and provides 125 kW/170 hp with a torque of 250 Nm. The full torque, which is typical for electric motors, is immediately available from a standstill and does not need to be built up first via the engine speed, as is the case with combustion engines. This gives the BMW i3 particularly high agility in every situation and impressive acceleration values: the BMW i3 accelerates from 0 to 60 km/h in under 4 seconds and to 100 km/h in only 7.2 seconds (7.9 seconds in the version with Range Extender). Equally impressive: the nearly silent driving experience.

The energy supply for the drive, as well as all other vehicle functions, is provided by a specially developed lithium-ion high-voltage battery, which again sets new standards in terms of energy efficiency. The intelligent heating/cooling system of the high-voltage battery ensures that energy performance (and thus the vehicle's range) is less affected by temperature fluctuations than it normally is with batteries of this type; thus, this makes a significant contribution

to both the performance and service life of the cells. An 8-year warranty or 100,000 miles is given for the high-voltage battery.*

Via the supplied charging cable, the battery is already charged for 80 % capacity in 6 to 8 hours.** The charging duration can be reduced by approx. 30 % with the optionally available Wallbox Pure.

** for 70 % of the charging capacity*

*** based on 12 AMP current*

To allow for an optimal range in every driving situation, during the development of the BMW i3 particular emphasis was placed on low energy consumption of the electrical components. For example, the interior heating system saves up to 30 % of electricity compared to a conventional electric heating system. Energy-saving LEDs are used for the interior lighting and are also available as an option for the exterior lighting.

In addition, the E-drive offers the possibility of braking via the accelerator pedal. If the driver takes his foot off the accelerator pedal, the electric motor assumes the function of a generator and feeds the energy gained from the motion of the wheels back into the high-voltage battery. This so-called energy recuperation generates a braking torque which leads to an effective deceleration of the vehicle and pays off in terms of energy savings for especially foresighted driving styles.

DYNAMICS

Innovative driving pleasure: the combination of high-performance electric motor, which provides for impressive acceleration values with an enormous torque, the particularly low centre of gravity and an ideal weight distribution leads to a fascinatingly agile driving experience.

The high torque of the electric motor is available over a very large speed range thus facilitating a very homogenous delivery of electricity. The single-stage transmission provides an optimal transfer of electricity to the rear wheels and accelerates the BMW i3 by means of electronic control evenly and without loss of power up to 150 km/h.

RANGE

In recent years, test customers have driven over 20 million kilometres with electric vehicles of the BMW Group. The wealth of experience from this flowed into the development of the BMW i3 transmission system, in which the typical commuter operation required a recharging of the high-voltage battery only every two to three days – and with the 130-160 km range of the BMW i3 is more than sufficient for everyday operation. For the BMW i3 with Range Extender, a range of approx. 240-340 km is possible. The dynamic range display shows destinations that can be reached directly in the form of a vicinity outline; depending on the destination, the range assistant recommends switching to the ECO PRO or ECO PRO+ driving mode in order to increase the electric range by about 30 % to nearly 200 km.* And if a longer journey is desired or necessary, Add-on Mobility allows the driver to switch to a BMW with conventional drive.

** depending on individual driving behaviour, determined in internal BMW consumption studies.*

SUSTAINABILITY

Reinventing mobility with sustainability in mind takes more than just a vision. You need answers to a plethora of emerging questions, the first of which is: Where does sustainability begin? The answer: in the same place as it ends.

BMW i uses a wealth of innovative BMW EfficientDynamics technologies and goes even further: From design to production,

The future of Urban Mobility

continues from page 33

from the useful life of the vehicle to its disposal, every detail is based on sustainability. Because sustainability is an attitude that doesn't have a beginning or an end.

PRODUCTION

The BMW Group has topped the Dow Jones Sustainability Index every year since 2005 as the world's most sustainable automobile manufacturer. Rather than become complacent, we were motivated to create new standards: the energy-intensive carbon fibre manufacturing process was set up in Moses Lake, USA, because it can be operated there using clean energy from one of the world's largest hydroelectric power plants - the Grand Coulee Dam. The BMWi-plant in Leipzig is also fully powered using electricity from 4 wind turbines installed specifically for that purpose on the plant premises.

In addition, the energy consumption required to produce the cars in the Leipzig plant was reduced by 50 % and water consumption by as much as 70 %.*

**compared to the industry-leading BMW Standard.*

USE

In order for these electric cars to be both extremely agile and remarkably efficient, an intelligent cooling system keeps the battery at its optimal operating temperature at all times. BMW i drivers can also activate exceptionally economical driving modes at the push of a button which extend the range by around 30 % to almost 200 km.*

Consistent sustainability means that even CO_2 emissions generated outside the car are reduced or avoided. This is why BMW i is working with sustainable partners including renewable energy producers to make electricity from renewable sources easily accessible to BMW i drivers.

**depending on individual driving behaviour, calculated in an internal BMW power consumption study.*

RECYCLING

How can electric components be recycled most efficiently? By reusing them. There are many ways to repurpose the high-performance lithium-ion high-voltage battery from a BMW i after its use in a car: easily and effectively as a power store in solar or wind power systems, for example.

BMW i is also a pioneer in the processing of carbon fibres and their recycling. To the BMW Group, remnants from carbon production and the production of carbon components are valuable materials that are either channelled back into the production process or reused in other areas.

But even that was not enough for us, so 95 % of the materials used to produce a BMW i3 can be recycled.

360° ELECTRIC

Within the 360° ELECTRIC portfolio, BMW i groups a wide range of innovative products and services that make electric driving a comfortable experience and a daily pleasure: from simple home charging and the ease of using a continually-expanding network of charging stations to networked navigation and the option of using conventional cars for holiday trips with BMW Add-on Mobility.

HOME CHARGING

Electric cars have many advantages over conventional vehicles – for example, they have a 'full tank' every morning, because they can be charged quickly and easily at home using the standard charging cable supplied. Or even faster and even more simply with the BMW i Wallbox. This wall-mounted charging station for home use increases charging capacity, reducing charging time and making it the ideal design accessory for BMW i vehicles. The installation service available through BMW i is part of the complete Wallbox package and is customised to your specific needs. And because BMW i promotes consistent sustainability in e-mobility, BMW i will also arrange the appropriate green electricity contract with a selected renewable energy provider.

CONNECTED DRIVE

BMW i is more than just an electric car – it is a visionary concept combining all-electric cars for daily use, innovative mobility services, local public transport and a new understanding of sustainability. The newly developed BMW i ConnectedDrive services are an important part of this concept. These link these components together seamlessly, permitting an intelligent, comprehensive and sustainable mobility experience.

NAVIGATION

BMWi Navigation with its networked BMW i ConnectedDrive services was developed specifically to make driving a BMW i as easy and convenient as possible. The centrepiece of BMW i Navigation is the Driving Range Assistant with dynamic range map, which takes into account all factors that are important for route navigation: battery charge level, driving style, traffic conditions and topographic nature of the route. Using BMW ConnectedDrive Real Time Traffic Information, the ECO ROUTE is even optimised on BMW servers. The calculation incorporates a traffic prediction, and the most efficient route is estimated in real time. The nearest available charging station is displayed at all times.

REMOTE APP

The BMW i Remote App shows you detailed information on the current status of your BMW i – e.g. car location, range, and battery charge level, service messages, and information on whether the doors are locked and the lights are off. The charging process can be initiated remotely using the weekly timer and the air conditioning activated by remote control right before setting off on a trip. The dynamic range map is also integrated into the BMW i Remote App. Destinations (points of interest, POIs) and locations of charging stations can be sent easily from the application directly to the car. The BMW i Remote App also measures the efficiency of each journey in a BMW i model and gives helpful tips on how to drive the car more efficiently and extend the range. The efficiency value of each journey can be anonymously shared with others and compared, if needed. wn

TECHNICAL DATA

CONSUMPTION	
BMW eDrive energy consumption in kWh/100 km	12.9
CO2 emissions in g/km	0
Energy efficiency (with Range Extender: CO2 efficiency)	
RANGE AND CHARGE TIME	
Electric range in km	190
Electric range (mean customer value) in km	130-160
Max. total range (most efficient mode) in km	190
Capacity of lithium-ion battery in kWh	18.8
Fast charging, e.g. at DC fast-charging station: DC; 125 A; 50 kW (80 %)	Under 30 min.
Charge time of high-voltage battery in h at 16 A (80%)	6-8
WEIGHT	
Unladen weight in kg (EU)	1,195/1,270
Max. permissible weight in kg	1,620
Permitted load in kg	425
Permitted axle load front/rear in kg	750/910
BMW eDRIVE	
Electric motor: Output in kW	125
Electric motor: Max. torque in Nm	250
PERFORMANCE	
Top speed fully electric in km/h	150
Acceleration 0–100 km/h in s	7.2
Elasticity 80–120 km/h in s	4.9
WHEELS	
Tyre dimensions front	155/70 R19
Tyre dimensions rear	155/70 R19
Wheel dimensions front	5Jx19
Wheel dimensions rear	5Jx19

Relying on the best international technology

The Gautrain is a modern, state of the art rapid rail system with some of the latest technology in its rolling stock, signaling, communications, ticketing systems and safety systems.

The Concession Agreement on the Gautrain was signed on the 26 September 2006 and construction commenced immediately. The Bombela Concession Company had to comply with specifications based on the latest international standards when developing the Gautrain.

Safety and security is central to the Gautrain's service offering and an Integrated Safety and Security Programme covers all scenarios of degraded and emergency operation of the system. The Gautrain system has developed a number of important measures to mitigate the risks, including:

- Hundreds of CCTV cameras will provide recorded coverage of all stations and trains as well as key locations along the route;
- The SAPS Railway Police as well as Gautrain's own security officers are present at all stations, car parks and inside the trains;
- Continuous satellite tracking of all feeder and distributor buses and
- Secure fencing along the route to prevent unauthorised access and vandalism of critical system assets.

High specification CCTV cameras keeps a watchful eye over the entire system. All stations, car parks and trains are monitored as well as entrances to the rail reserve, tunnels, and operational areas. The cameras are monitored at the Operational Control Centre (OCC) in Midrand which also coordinates appropriate rapid responses to any abnormal situation or illegal activity. Highly trained operators supervises the closed circuit television networks, security surveillance monitors, automated ticketing and access control systems, public address systems, emergency telephones and passenger information displays. The OCC also maintains wireless voice communication contact with each station and train and bus driver.

The trains used on the Gautrain system are amongst the safest in the world. The train sets are based on the Bombardier Electrostar design which boasts an enviable international safety record. Before entering into a commercial service each Gautrain set is subjected to a long and vigorous testing and commissioning process. This process entails tests on all systems and sub-systems from brakes and power, to air-conditioning and communications. In total, each train-set completes approximately 3000 km on the test-track before being certified for operations.

The Onboard Automatic Train Protection (ATP) is a safety-critical system that continuously supervises the movement of the train. It warns the driver in case of over-speeding and when approaching stop signals or changes to the static speed profile. If the driver does not reduce speed sufficiently, the system will order the vehicle to apply brakes. This means

Relying on the best international technology

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that the ATP system will not intervene as long as the driver drives below the permitted speed and stops before signals in 'stop'. In order to perform the supervising functions, the ATP system receives information from the balise, such as speed restrictions, distances and gradients. The ATP is a continuously supervising system using intermittent updating, which means that the speed is continuously supervised but the information is given to the vehicle at 'information locations'.

An Information Location consists of two balises mounted in the track. An antenna unit (CAU, Compact Antenna Unit) mounted underneath the vehicle sends an "activation signal" towards the ground as long as the vehicle is moving. When a balise receives this signal, it responds by transmitting an IL telegram, containing necessary track information. The ATP system is designed for a maximum train operational speed of 160kph. The design recognises that the train can go faster before an ATP intervention occurs. The interlocking provides movement authority information to the train (via the balise groups) that allows the train to calculate and supervise a smooth and gradual brake to the target restriction

An important component of the Testing and Commissioning phase is the system integration testing. This process ensures that, not only do all train, signaling, communications and security systems function properly on an individual basis, but that they also function in a fully integrated fashion as required by modern railway system coverage and functionality and telephone system functionality.

The outcomes of the Testing and Commissioning and system integration processes are measured against strict technical criteria to ensure compliance with all design and safety requirements. In terms of South African legislation, the acceptability of the system must be demonstrated to the Railway Safety Regulator before a 'Safety Permit is granted.

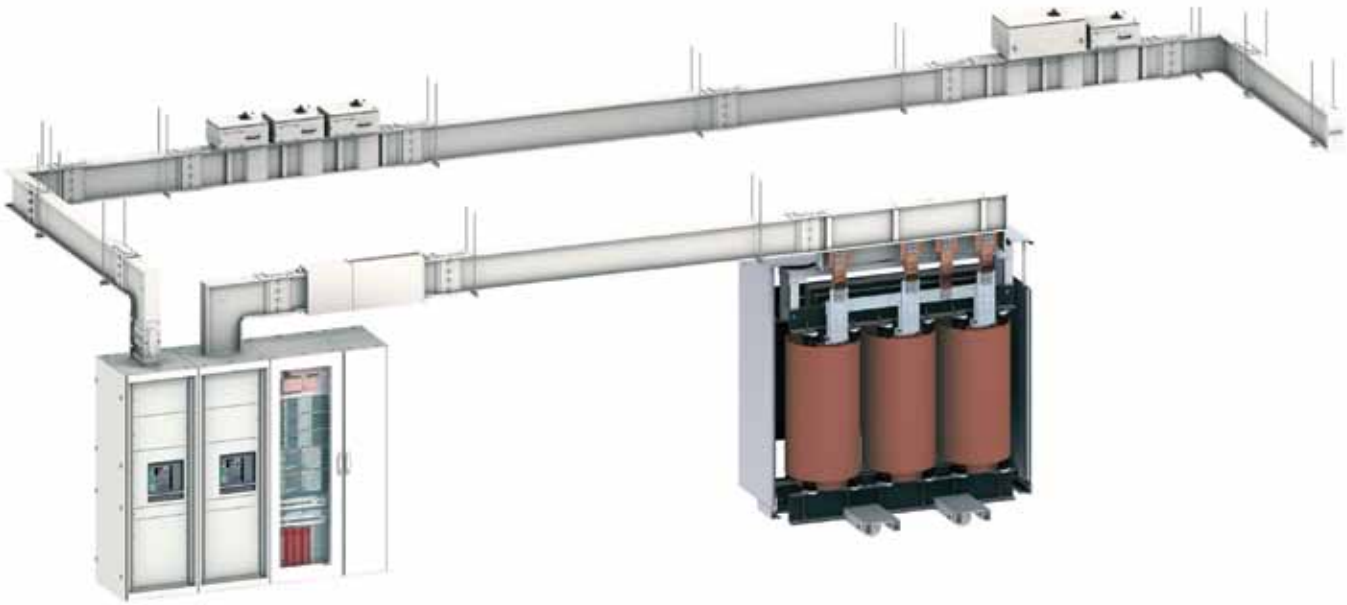
The Gautrain's Operator utilises the latest operating and management systems. There's a Performance Monitoring System that ensures that high standards on issues such as availability, punctuality, cleanliness, maintenance and safety and security are met. If not, penalties apply. All train and bus movements are controlled at the OCC. The signaling solution comprises the Bombardier's CITYFLO 250 system which is a fixed block signaling system based on 'distance to go' principles with vital information being transmitted to the onboard automatic train protection system from balises in the track.

Another technology innovation within the Gautrain is the fare collection system which is based on contactless smart-card (CSC) system which enables customers to load a variety of different journey products, ranging from single trips to monthly tickets, onto the same credit-card sized card and to re-use the same card over and over again without having to buy a new ticket for each journey. The CSC is a contactless means of payment using a smart chip and Radio Frequency Identification that will enable customers to simply hold their card near to a Gautrain card reader (located at all entrances and exists to stations and parking areas and on the buses) in order for the system to register their journey.

The CSC system allows seamless transfers between Gautrain's bus, train and parking services. Customers using more than one service within a single journey enjoys a reduced fare. Customers are also able to register their cards with the Gautrain operator which enables immediate blacklisting of the card should it be lost or stolen. Any unutilised value on the lost card can then be transferred to a new card. wn

Canalis KT

800 - 5000A



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Capturing assets

Electrical infrastructure planning, information and asset management engineers Coert Scherman and Attie Senekal discuss a different approach to conventional field data recording methods which provided benefits to eThekwini Electricity for its asset capture project.

BY | COERT SCHERMAN | ATTIE SENEKAL

As part of developing and implementing an integrated infrastructure asset management business plan for eThekwini Municipality in eastern South Africa, eThekwini Electricity embarked on an initiative to capture and model all of its electrical network assets.

This article explores the various components of this exercise with emphasis on the solutions deployed to address project challenges, both from the municipality and the service provider's perspectives. It also discusses the resulting benefits unlocked during and following project execution, with improved detailed data availability and is how this project contributes to the smart grid initiatives of the municipality.

OBJECTIVES

The primary objective was to comply with the South African Accounting Standards Board - Generally Recognised Accounting Practice - Section 17 (Property Plant and Equipment) (known as GRAP17) and to enable the municipality to effectively manage its assets by providing a solid foundation of reliable and detailed asset information.

Secondary objectives included establishing a connected network model and enabling data integration between systems. eThekwini Electricity engaged the services of Aurecon to assist with the data collection and modelling exercise.

The project team had to find innovative solutions to a number of issues inherent to an exercise of this nature, including:

- Planning and executing a very comprehensive field exercise spanning an area of over approximately 2,300km^2 ensuring high quality of data
- Developing a connected network model with more than 900 000 network equipment items recorded from the field
- Defining the asset structures for the purpose of an equipment- & asset register
- Propagating information through all relevant systems with a view on future system integration

A DIFFERENT APPROACH TO CONVENTIONAL FIELD CAPTURE

Conventional field capture projects focus on capturing attribute data while in the field. With the low cost of high definition cameras and the low cost of storage, this changes the data capture landscape.

The project team took a different approach that proved to reduce cost and enhance quality by moving most of the attribute capture work to office teams supervised by technical specialists.

High resolution aerial photography also proved to be highly effective as many asset points could be identified on the aerial photographs assisting in verifying positional accuracy of field data recorded, as well as identifying missed assets. A network enabled Geographical Information System (GIS) environment was used to ensure data quality and to enable future benefit to eThekwini Electricity.

MINIMISING TIME SPENT IN THE FIELD

Field data capture exercises of a technical nature often contend with the following major challenges:

- Detailed recording of asset data in the field is time consuming and places strain on resources due to harsh environmental conditions and at times hostile environments
- Electrical network asset data is of a technical nature and often requires qualified field personnel to correctly identify the asset and record the required asset data, which greatly increases the cost of field exercises

Capturing assets

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- Field data capture errors frequently occur as a result of capturer fatigue and incorrect field interpretation.
- Where data queries exist, there is no simple means of validating data apart from revisiting the specific site
- No additional information is available post capture, evidence available is that equipment exists or is in the state as recorded.

On this project, field work was limited to recording a GPS position, capturing detailed photographs of the assets and recording minimum attribute data. This resulted in significant time and cost savings as well as improved data quality.

MAXIMISING UTILISATION OF RESOURCES

The project team took a different approach whereby office modelling relied on domain specialists, a well-structured data capture process and state-of-the-art information systems in support of a largely unqualified, data capture and modelling team. The engineers and supervisors initially trained new data capturers and thereafter assisted with ad hoc queries and interpretation of data where the data capturers did not have the know-how.

MODELLING SOFTWARE

Data modelling was carried out in a Geographical Network Information System (GNIS) supporting real connected network modelling. This greatly enhanced modelling quality and added value to the deliverable as a result of functionalities enabled from connectivity. Most municipalities in South Africa maintain a GIS model which simply represents equipment location but does not include actual connectivity that supports advanced functionality including capturing and managing a Property/ Customer Network Link (PNL), which is of utmost importance for network operations as well as for smart grid planning and implementation projects. The model implemented allows full connectivity from the customer to any upstream device though network topology.

Figure 1: Minisubstation containing 11kV/400V transformer, 11kV ring main unit and low voltage circuit fuses

The GNIS environment allowed for development of automatic placement routines for template equipment which generated the relevant equipment at the GPS location. As an example a miniature substation shown in Figure 1 and Figure 2 consists of MV breakers, LV fuses, a busbar, transformer and container. Using the office captured attributes and the GPS position a complete and specific equipment model is automatically generated in the GIS. This reduced the modelling component to mainly establishing connectivity by connecting networks between equipment.

THE CONNECTED NETWORK MODEL

Network modelling includes rule sets with regards to connectivity enabling the utility to trace/follow networks from supply source to client connection adhering to actual network connectivity behaviour. This approach to modelling holds many benefits to the utility – it underlies all network planning activities and is essential for network operations.

As such, GNIS is the application of choice for networked utilities, including electricity, water, gas and telecommunications worldwide. GNIS software presents a realistic view of the network in terms of geographical location, how equipment connects to each other and supporting technical data for engineering analysis.

As a result of GNIS modelling, the project not only recorded asset data, but also delivered logical information regarding the assets, including:

- Network connectivity modelled from MV devices to LV networks
- Supply areas for devices is dynamic based on network open points
- Asset plant slot identification could be

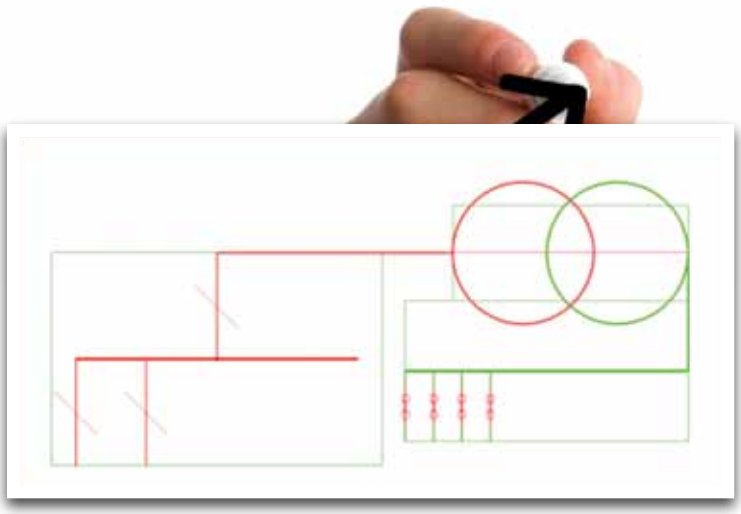

Figure 2: Minisubstation connected network model, allowing for 11kV cable connections to 11kV ring main unit (left), transformation from 11kV to 400V (upper right) and connection to LV cable circuits at LV fuses (right)

automated based on location within network

- Network portions completed by data modellers could be subjected to various test routines to ensure data and modelling accuracy.

Connected network modelling is still a relatively new concept for many local municipal GIS departments in South Africa who do not model connectivity.

INFORMATION IS KEY TO UNLOCKING BENEFITS

Proper asset management can only be implemented with good data about those assets, including their location, technical attributes, dynamic attributes and logical attributes. In electrical utilities this is a big dataset to extend and keep updated with asset counts that could easily run into millions. It is impossible to stay in control of your asset data without proper business processes supported by relevant information systems influencing asset data.

GNIS information is helpful in providing decision makers strategic information about the network equipment for example:

- Visual representation of location of all assets / equipment
- Visual representation of connections and dependencies of equipment on one another. This enables a lot of previously impossible tasks such as:

  - Coordination of maintenance efforts by knowing which other equipment will be outaged through a scheduled HV Circuit Breaker Maintenance procedure.

Capturing assets

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- Grouping of outstanding maintenance work-orders by spatial proximity
- Analysing resources / tools required to perform specific maintenance tasks

- Accurately tracking costs such as:
  - Installed kilometres of cable
  - Correct area calculation for vegetation management along feeder corridors
- Accurately informing consumers of intended outages based on connectivity
- Optimising existing transformer capacity through load tracing on connected networks
- Accurate reallocating of customers and equipment to new infrastructure is now much simpler. The GNIS allows for the "re-creation" of the hierarchies through connectivity
- Providing a holistic and visual representation to determine allocation of resources to specific functions or geographical locations
- Locating and identifying important / sensitive customers and notifying them of intended outages

ENABLING SMART GRID TECHNOLOGY

When analysing the functionality and requirements that utilities place on smart grid implementation, it is clear that the technology is more about managing assets and information about assets rather than protecting revenue or identifying illegal connections.

The various perspectives and requirements from smart grid implementations for the generation, transmission, distribution and customer sector point of view, rely heavily on accurate and readily available information about the customers, plant, network connections, energy sources and sinks, markets, real-time tariffs, network status, consumption, incidents, smart device location, "area of influence" and more.

To enable the above inter-operability, sufficient emphasis needs to be placed on the requirement of network information availability and how the network is connected or related to the various devices in the field.

As a result of this project, eThekwini Electricity now has the ability to perform connected information analysis and unlock full smart grid requirements. Further enhancements can be implemented to ensure communication connectivity is also achieved.

GETTING YOUR ASSETS UNDER CONTROL

Due to various reasons very few entities have all of their asset data under control, especially at the lower voltage levels. This can be corrected by:

- Developing and implementing asset and equipment structures that make sense for your business and systems
- Establishing business processes and workflow that will ensure any future asset changes are correctly recorded in the relevant information systems
- Utilising available electronic and hard copy data to capture historical asset data (the decision to follow this step should be made based on the quality and control of available historical data)
- Field exercise to capture and update assets with lacking data

A HOLISTIC VIEW OF ASSETS

Asset management is far greater than simply being compliant with guidelines such as GRAP17 or IFRS. It gives utilities the opportunity to really understand, optimally plan, effectively manage, operate and maintain their assets. Major investment is often made to ensure that reporting on assets is in compliance with regulatory requirements, and utilities often miss opportunities to really address proper asset management, through projects and funding available.

eThekwini Electricity realised the effort involved in enabling proper asset management, and will in future reap the benefits of investing in data capturing, implementing processes, systems and continuous training ensuring that through the unequivocal support of management the journey towards excellence in asset management is successful.

An enterprise asset management system is not just a single piece of software, but rather a system consisting of multiple parts, being; processes, resources and various technical and non-technical software applications working in unity to realise asset management.

There is a significant dependence on supporting systems to keep asset data up to date. Any entity serious about asset management should work through an exercise to define what asset data they need for proper asset management.

This should be based on a holistic view of the assets from where a data attribute ownership mapping can be done, which defines data ownership and responsibility for the various information systems. wn

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Power Quality and Energy Efficiency - an innovative approach

Impact Energy's leading edge technologies, systematic consulting and engineering approach to identify Power Quality related consequences; reduce losses and sustain real savings for all sectors of power users and power suppliers.

BY | SISHAL KUWAR-KANAYE
BTECH | GWCPM | CEM | CMVP

Establishing a Power Quality (PQ) consequence and cost fingerprint for any site is the key step in driving reliability and engineering value back into power networks. Impact Energy provide the transition from establishing Power Quality consequence and cost baselines into real financial value through leading edge Elspec Power Quality Measurement and Solutions Technologies.

HOW TO SPOT THE OPPORTUNITY

It is common knowledge that continuous mining and manufacturing process plants and digital industries are the most vulnerable to power quality related disturbances. Of similar significance is the growing awareness of Economic losses that supply related entities i.e Eskom, IPP's and Municipalities have to factor and account for as part of economic sustainability. Network components suffer extra losses, reduced operational efficiency, abnormal tripping, progressive degradation and premature failure because of various PQ anomalies. The long term financial losses as a result of poor power quality are those that are not commonly and easily quantified i.e. production losses, scrap, inferior product quality, rework, additional labour and maintenance costs, increased and frequent sustaining capital investment etc. So spotting the opportunity is simple, the challenge really lies in quantifying the size of the prize.

Blackbox

POWER QUALITY IMPACT ASSESSMENTS

Different industries have varying perceptions of how PQ affects the reliability of the operation. It is vitally important when conducting Power Quality Impact Assessments to look beyond theoretical and technical impacts of poor power quality. Every effort as far practical should be made to draw correlation and congruity between perceived customer operation implications and power quality data. The Technical Loss considerations and associated implications are tabled and hold true for almost all types of industry regardless of customer perceptions. This, together with any form of quantified operational loss analysis serve as a sound basis for investment into Power Quality Solutions.

Some examples of perceived operational implications are also tabled but will vary across industry and different sectors of power users and suppliers.

PERCEIVED OPERATIONAL IMPLICATIONS

Estimating the financial losses associated with power quality disturbances can be complex as there are many uncertainties involved. Where effective analysis has been conducted these costs have been found to be significantly high compared to the overall cost base of an organization. It has been found that the highest contributor (approximately 85%) to PQ related financial losses are as a result of voltage dips, transients and interruptions.

Other financial losses (15%) are because of poor power factor, harmonics, flicker, earthing and electro-magnetic

Perceived Operational Implications		
Perceived Implication	**Affected Equipment**	**Assessed PQ Anomalies**
Restarting of key processes and losses in production	Variable Speed Drives	Voltage dips, causing VSD protection device tripping
Nuisance tripping of large loads such as Furnaces	Circuit breakers, transformers and power cables	Main utility Grid Frequency loss protections activated
Computer lock-ups and data loss	IT equipment (that are sensitive to change in voltage signal)	Presence of earth leakage causing small voltage drops in earth conductors
Computer, electronics equipment damage	Electronics devices like Computers, DVD player etc.	Lightning or a switching Surge
Malfunctioning of motors and process devices. Extra heating, decreased operational efficiency and premature aging of the equipment's	Motors and process devices	Presence of voltage and current harmonics in the power supply
Financial Loss Considerations: PQ Operational Failure		

Energy Saving (kWh) Typical Values:				
Description of change in Supply Conditions		**Range of Saving (typical values)**		**Accuracy of estimation using continuous cycle by cycle measurements (error in %)**
Savings due to reactive current and harmonics reduction				
Transformers - Current reduction - Harmonics reduction (skin effect, hysteresis)		0.25%-0.75% 0.25%-1.0% (*)		±(5-10)% ±50%
Cables - Current reduction - Harmonics reduction (skin effect)		0.5%-1.0% (**) 0% -0.1% (*)		±(5-10)% ±15%
Load - Harmonics reduction (skin effect, hysteresis, negative sequence field due to 5th, 11th etc')		1.0%-3.0% (*)		±30%
Saving due to optimal voltage control				
	One Step – 2.5%	2.0%-4.0%		±(5-10)%
	Two Steps – 5%		6.0%-8.0%	±(5-10)%
Total Range Saving		(4-9)% Approximately	(6-13)% Approximately	±20%
(*) Pending on the THD(V) and THD(I) level (**) Pending on distance				

Typical Technical Loss (kWh) Opportunity Considerations:	
Description of change in Supply Conditions	**Effect on Equipment**
Savings due to reactive current compensation and harmonics reduction	
Transformers - Current reduction - Harmonics reduction	The presence of harmonic current increases the core losses, copper losses and stray-flux losses. These losses consist of "no load losses" and "load losses".
Cables - Current reduction - Harmonics reduction	Additional "Ohmic losses" (I^2R losses) in the line and neutral conductors. The eddy current, which is generated due to the relative motion of the electromagnetic field and circulating current in a conductor, is the root cause of skin effect.
Capacitors - Current reduction - Harmonics reduction	Voltage harmonics increases dielectric losses in capacitors and reduction of operational lifetime of PFC capacitors. Resonance and possible catastrophic failures of capacitor bank systems.
Load - Harmonics reduction (skin effect, hysteresis, negative sequence field due to 5th, 11th etc')	Increased motor currents in individual phases, resulting in heating and copper losses. Other mechanical/electrical issues e.g. torque reductions, cooling fan problems, insulation degradation. Tripping of VSD's during unbalance conditions.
Saving due to optimal voltage control	For non-linear loads, voltage variation due to load variations affect power consumption patterns. Through cycle by cycle reactive energy compensation, voltage is increased and more stable. It is possible to tap down transformers and this has potential energy saving benefit.

compatibility (EMC) related problems. The total cost of PQ disturbances for a production company consists of expenditures in various accounts as follows:

- Staff costs - the cost of personnel rendered unproductive for disrupted work flow
- Work in progress - includes costs of raw material involved in production which is inevitably lost, labour costs involved in production, extra labour needed to make up lost production etc.
- Equipment damage – complete or partial damage, extra maintenance, need for standby equipment
- Other Costs – penalties due to non/late delivery, environmental fines, personal injury, insurance increase etc.

THE INNOVATIVE AND SYSTEMATIC POWER QUALITY APPROACH

Energy is supplied on a continuous cycle-by-cycle basis, naturally PQ analysis and loss analysis should be done on a cycle-by-cycle basis for an accurate representation of the performance of a power network. This is the principle distinctive offering by Impact Energy, brand ambassadors and exclusive agents for the Elspec product and service portfolio.

A formal engagement with Impact Energy on an innovative systematic PQ approach ensures the following key deliverables:

- Comprehensive Power Quality Study
- PQ Modelling and Loss Analysis
- PQ Solution Conceptual Offering
- Present a loss analysis and business case evaluation
- Obtain approval on designs and prepare for procurement and execution phase
- Official report for Energy Saving
- Power Quality Metering and Solution Routine Reporting and Maintenance.

The innovative design of the BLACKBOX device series is a technological breakthrough that provides the perfect PQ analysis solution. The built-in capabilities of the series are uniquely adaptable to address the individual needs and requirements for almost any application.

Elspec offers a wide range of real-time power quality enhancement systems. Our innovations optimize power consumption for electrical energy savings & offer comprehensive solutions for power quality such as: power factor correction, energy savings, voltage support, flicker reduction, current spike reduction, harmonic filtration, reduction of reactive power during large motor startups & many other applications for a variety of dynamic loads. wn

2015 Membership Fees

Council meeting held on 5 September 2014 approved subscription & entrance fees as from 01 January 2015 will be as per schedule indicated below. Council agreed to a discount for fees paid before 28 February 2015. Members are therefore encouraged to pay promptly to minimize increase.

Grade of Membership	Annual Subscriptions paid before 28 February 2015		Annual Subscriptions paid after 28 February 2015		New Members FEES * see Notes 1 & 4 below.	
	RSA incl VAT (R)	Outside RSA excl VAT (R)	RSA incl VAT (R)	Outside RSA excl VAT (R)	RSA incl VAT (R)	Outside RSA excl VAT (R)
Student	134	94	167	118	167	118
After 6 yrs study	860	602	1,075	753	1,075	753
Associate	860	602	1,075	753	1,075	753
Member	951	666	1,189	832	1,189	832
after 6 years	1,112	778	1,390	973	1,390	973
after 10 years	1,163	814	1,454	1,018	1,454	1,018
Senior Member	1,163"	814	1,454	1,018	1,454	1,018
after 6yrs/age 40	1,260	882	1,575	1,103	1,575	1,103
Fellow	1,260	882	1,575	1,103	1,575	1,103
Retired Member (By-law B3.7.1)"	534	373	661	467	n/a	n/a
Retired Member (By-law B3.7.3)	nil	nil	nil	nil	n/a	n/a

PLEASE NOTE: In terms of Bylaw 3.2 annual subscriptions are due on 1st January 2015

1. Entrance fee for all grades of membership is R810.00 (except Students which is free)
2. Transfer fee to a higher grade is R450.00 for all grades of membership (except Student within 3 months of qualifying)
3. Members are encouraged to transfer to a higher grade when they qualify. It will be noted that the fees of Member and Senior Member grades after 10 and 6 years respectively are equal to the fees at the next higher grade.
4. Members elected after June 2015 pay a reduced subscription fee.

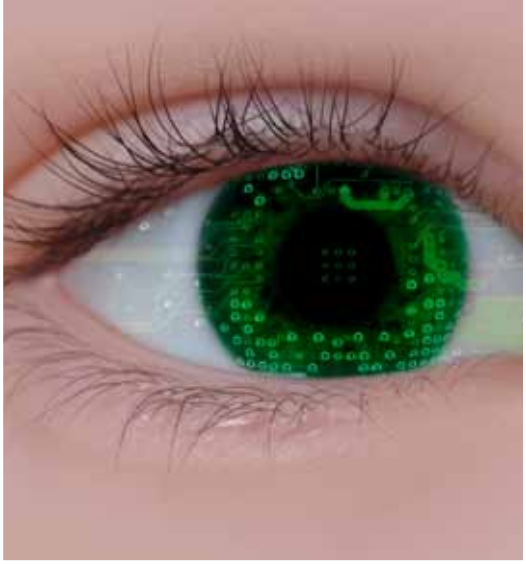
By-law B3.7.1 reads *"a member in good standing who has been a member of the Institute for at least ten (10) consecutive years, has reached the age of sixty (60) and who is no longer actively engaged in the profession, may apply to Council for an adjustment in the amount of his subscription."*

By-law B3.7.3 reads *"any member complying with the conditions of B3.7.1 but who has been a member of the Institute for not less than 25 consecutive years, shall be exempt from the payment of further subscriptions. Members who comply with the requirements of By-Law B3.7.3 may make written application to Council for exemption from paying subscriptions."*

By-law B3.9 reads *"any member in good standing who has been a member for fifty (50) consecutive years shall be exempt from the payment of further subscriptions."*

Members not in good standing by failing to pay their subscriptions by end of June of each year will subject to Council decree be struck-off the SAIEE membership role.

Members in good standing and no longer in substantive employment and do not receive payment or salary for work done may apply to Council for a reduction in their annual subscriptions.



BFA IS DEDICATED TO PROVIDING A CONSULTING SERVICE THAT WILL BENEFIT ITS CLIENTS BY MEANS OF APPLYING THE LATEST TECHNOLOGY PARTICULARLY WITH RESPECT TO ENERGY SAVING, WITHOUT COMPROMISING THE AESTHETIC AND CORPORATE IMAGE OF THE CLIENT AT THE MOST ECONOMICAL COST.

BERGMAN FISHER ASSOCIATES (BFA)
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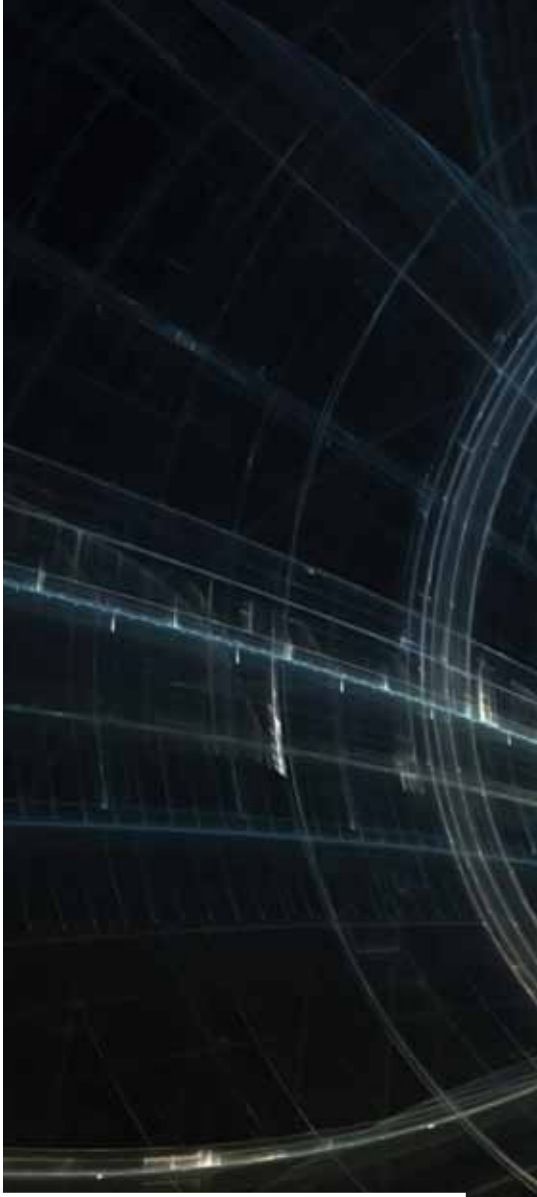
Waves and Vibes after Maxwell



Since ancient times, the Sun, as primary source of light and heat sustaining life on Earth, has been held in awe by cultures worldwide and given divine status.

BY | DUDLEY BASSON

The nature of light has seemed mysterious for millennia. Scientific minds have generally thought of light as having a corpuscular nature. Roman poet Lucretius declared: "*The light and heat of the Sun are composed of minute atoms which, when they are pushed off, lose no time in shooting right across the interspace of air in the direction imparted by the push.*"

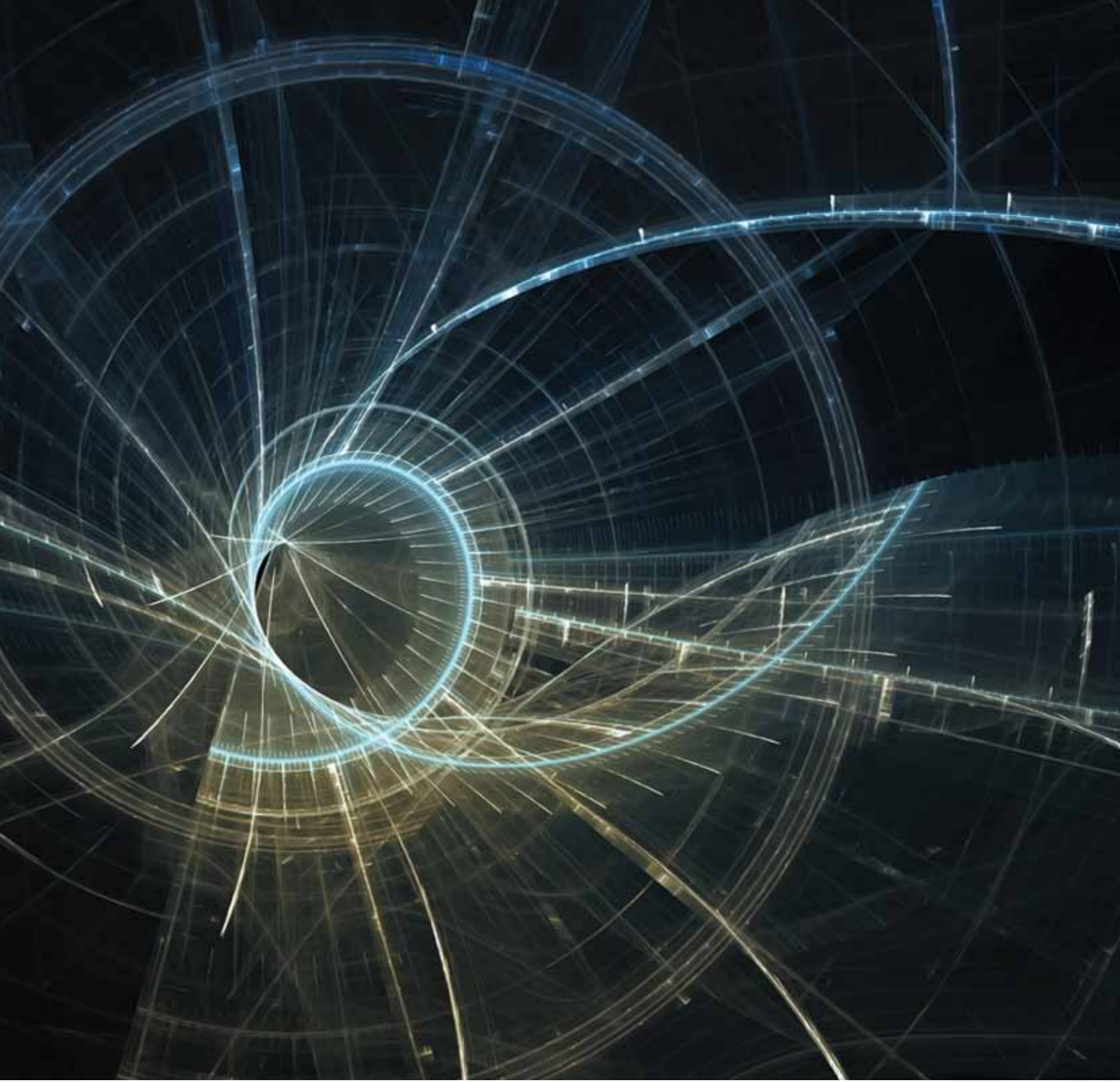
There seemed no need to regard light as anything other than streams of particles. Even Newton endorsed the corpuscular theory, despite having done experiments with light which could have proved to him that light did indeed have a wave nature.

The polymath Thomas Young (1773-1829) had a phenomenally wide range of interests and expertise which caused him to become known as "*The man who knew everything*".

He is credited with performing the first 'double-slit' interference experiment demonstrating the wave nature of light. In the following century the 'two slit' experiment would prove that electrons also had a wave nature.

Young commented on the nature of light: *The nature of light is a subject of no material importance to the concerns of life or the practice of the arts, but it is in many other respects extremely interesting.* Young had phenomenal linguistic ability having learned Greek and Latin and was

Thomas Young (1773-1829)



acquainted with French, Italian, Hebrew, German, Chaldean, Syriac, Samarian, Arabic, Persian, Turkish and Amharic. He made a huge contribution to the decipherment of the Rosetta stone.

He learned the Coptic language which he was able to link to the demotic on the stone finding the pronunciation of the ancient Egyptian names. The final decipherment of the hieroglyphics was achieved by Champollion.

Young did groundbreaking work on colour theory which was taken further by Maxwell. He took a low profile with his scientific work as he thought that it might deter patients from his medical practice. Young was mentioned by Herschel, Helmholtz, Maxwell and Einstein.

James Clerk Maxwell (1831-1879) achieved the greatest triumph of theoretical physics that had ever been seen by mathematically proving that light consisted of polarized transverse waves of magnetic and electric fields oscillating at right angles to each other.

As frequently happens with great discoveries, they do not only bring new insights; they can also bring unsuspected new and deeper mysteries.

Max Karl Ernst Ludwig Planck (1858-1947) came from a family of distinguished academics. In 1857 the family moved to

Waves and Vibes after Maxwell

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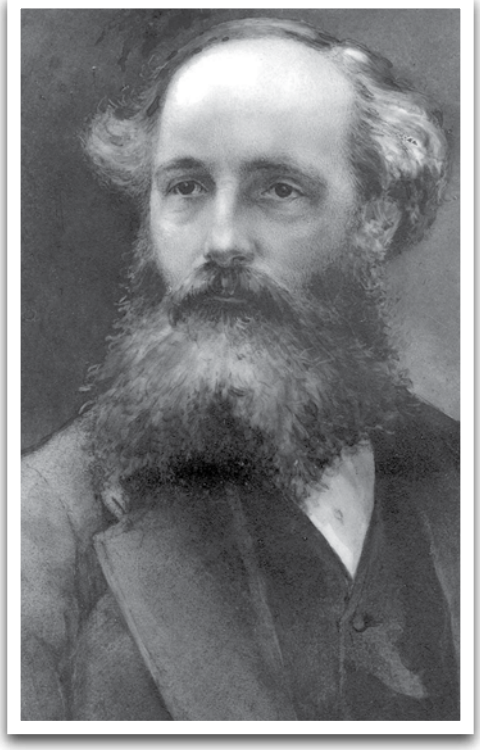


James Clerk Maxwell (1831-1879)

Munich where Max graduated at high school. Max was musically gifted, taking voice lessons as well as piano, organ and 'cello. Before he began his studies at the University of Munich he discussed the possibility of a musical career with a musician. He was told that if he needed to ask for advice then he should study something else. When Max decided to study physics he received miserable advice from physics professor Philipp von Jolly who said: *"In this field, almost everything is already discovered and all that remains is to fill in a few holes."*

The young Max had a different idea: *"The outside world is something independent from man, something absolute, and the quest for the laws which apply to this absolute appeared to me as the most sublime scientific pursuit in life."*

In 1877 Planck went to Berlin for a year of study with the famous physicists von Helmholtz and Kirchhoff and also mathematician Weierstrass. In 1879 he presented his dissertation on the second law of thermodynamics – entropy. He became an associate professor at Kiel University in 1885 and full professor in Berlin in 1892. Of this time he wrote:

"In those days I was essentially the only theoretical physicist there, whence things were not so easy for me, because I started mentioning entropy, but this was not quite fashionable, since it was regarded as a mathematical spook."

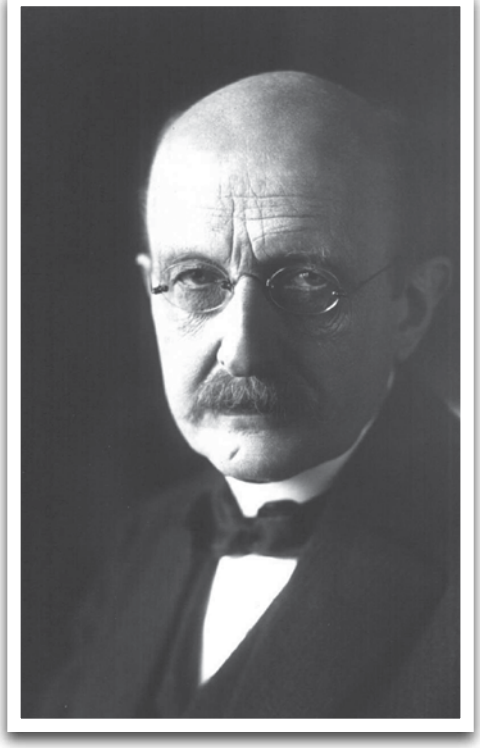
He started a course of lectures on theoretical physics. Lise Meitner commented: *"… dry, somewhat impersonal."*

English participant James Partington remarked: *"… using no notes, never making mistakes, never faltering; the best lecturer I ever heard."*

An amusing incident once occurred when Planck went to give a lecture on radiant heat. When he asked in which room the lecture was to be held, he was told: *"You are much too young to be attending the lecture of the esteemed Professor Planck."*

In 1894 Planck devoted himself to the problem which would make him famous – black body radiation. How does the intensity of electromagnetic radiation emitted by a black body (a perfect absorber) depend on the frequency of the radiation?

There were two laws to describe this – the Rayleigh-Jeans law which only gave correct values at low frequencies and the Wien law which only gave correct results



Max Karl Ernst Ludwig Planck (1858-1947)

at high frequencies. Planck found that he could only derive a satisfactory equation if light was emitted in 'packets'. For several years he did not think that these 'packets' corresponded with reality but were merely a mathematical trick. He was forced to conclude that the energy of the 'packets' was proportional to frequency and hence the famous quantum of action *"Planck's Constant"*.

His discovery of his famous constant led him to discover a system of natural physical units: Length, time, mass etc. He was awarded the 1918 Nobel Physics Prize for his epoch making discovery of quantum theory. Einstein was able to build on Planck's theory and presented a paper on the photoelectric effect for which he too was awarded a Nobel Prize.

In 1887 Planck married Marie Merck who bore him four children: Karl, the twins Emma and Grete and a second son Erwin. The Planck home became a social and cultural centre for jointly playing music and was visited by well known scientists such as Einstein, Lise Meitner and Otto Hahn. Lise Meitner once mentioned a musical evening at Planck's Berlin home when Planck, Einstein and a professional 'cellist played Beethoven's B-flat major piano trio (Archduke): *"Listening to this was marvelously enjoyable, despite a few unimportant slips from Einstein … Einstein was visibly filled with the joy of the music and smiled in a light hearted way that he was ashamed of his dreadful technique. Planck stood quietly by with a blissfully happy face and, hand on heart, said: "That wonderful second movement!"*

Einstein enjoyed attending concerts. A memorable concert that he attended was the début of the thirteen year old violinist, Yehudi Menuhin, in 1929 with the Berlin Philharmonic Orchestra conducted by Bruno Walter. The mammoth program comprised a Bach concerto and the celebrated Beethoven and Brahms concertos. Einstein was so moved by the brilliant performance that he embraced the young teenager and exclaimed: *"Now I know that there is a God in heaven!"*

An interesting incident occurred in 1913 when Planck went to visit Einstein who told him of his work on the General Theory of Relativity. Planck remarked: *"As an older friend I must advise you against it, for in the first place you will not succeed, and even if you succeed, no one will believe you".*

Einstein published his General Theory of Relativity in 1916 which had huge implications for physics and cosmology. An important prediction was the existence of gravitational waves.

Dr Louis Victor Pierre Raymond duc de Broglie (1892-1987)

After a sea voyage from Europe to New York with Chaim Weizmann in 1921, Weizmann told reporters: *"Einstein explained his theory to me every day, and on my arrival I was fully convinced that he understood it".*

Physics was left with the troublesome conundrum that light has both a particle and a wave nature depending on the method of observation. This was only the beginning – it was subsequently discovered that physical particles had a wave nature.

French nobleman, Dr Louis Victor Pierre Raymond duc de Broglie (1892-1987) made huge contributions to quantum theory and wave mechanics. In his doctoral thesis of 1924 he described the wave nature of electrons based on work by Einstein and Planck. At the 1929 Nobel Prize award ceremony, Professor C.W. Oseen, chairman of the Nobel committee for Physics of the Royal Swedish Academy of Sciences, paid tribute to de Broglie, concluding his presentation address with: *Monsieur Louis de Broglie. When quite young you threw yourself into the controversy raging round the most profound problem in physics. You had the boldness to assert, without the support of any known fact, that matter had not only a corpuscular nature, but also a wave nature. Experiment came later and established the correctness of your view. You have covered in fresh glory a name already crowned for centuries with honour. The Royal Academy of Sciences has sought to reward your discovery with the highest recompense of which it is capable. I would ask you to receive from the hands of our King the Nobel Physics Prize for 1929.*

The work of de Broglie would be taken further by physicists Heisenberg and Schrödinger, who stood as rival giants, much like Leonardo and Michelangelo of the Renaissance art world. Their personalities could hardly have been more different – Schrödinger was the rakish philanderer who could well have had the Rigoletto aria "Questa o quela" as his theme song. Heisenberg was the solid, decent family man and an accomplished concert pianist.

Erwin Schrödinger (1887-1961) made profound contributions to general relativity, radioactivity, wave mechanics and colour vision. He had a brilliant academic career and received his doctorate in 1910 for his dissertation *"On the conduction of electricity on the surfaces of insulators in*

Waves and Vibes after Maxwell

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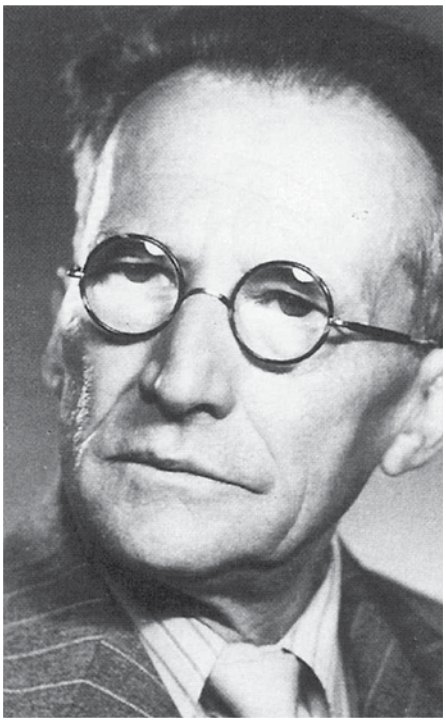


Erwin Schrödinger (1887-1961)

moist air." In 1925 Schrödinger gave a seminar on de Broglie's work which was to have a profound influence on the future of physics. Dutch physicist Peter Debye, a student of Sommerfeld, suggested that there should be a wave equation. Within a few weeks Schrödinger had found his epoch making wave equation. He published his revolutionary work on wave mechanics and general relativity in 1926 which was received with great acclaim.

Planck described it as: Epoch making work. Einstein wrote: … *the idea of your work springs from true genius.*
... and again two days later:*I am convinced that you have made a decisive advance with your formulation of the quantum condition.* Paul Ehrenfest wrote: *I am simply fascinated by your wave equation theory and the wonderful new viewpoint it brings. Every day for the past two weeks our little group has been standing for hours at a time in front of the blackboard in order to train itself in all the splendid ramifications.*

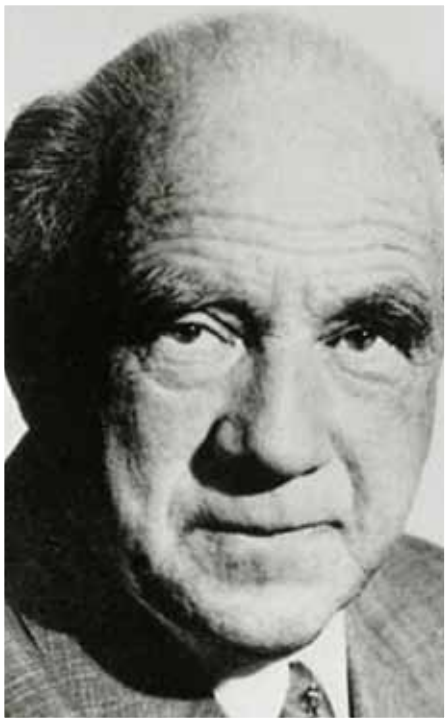
By 1960, more than 100 000 papers had been written based on the application of Schrödinger's wave equation.

Not everyone was pleased with Schrödinger's wave mechanics. In a letter to physicist Wolfgang Pauli, Werner Heisenberg (1901-1976) wrote: *The more I think about the physical portion of Schrödinger's theory the more repulsive I find it … what Schrödinger writes about the visualisability of his theory is probably not quite right.*

Schrödinger was not enthusiastic about Heisenberg's Matrix Mechanics and wrote in 1926: *I knew of Heisenberg's theory of course, but I felt discouraged, not to say repelled by the methods of transcendental algebra, which appeared difficult to me, and by the lack of visualisability.*

Heisenberg introduced his Matrix Mechanics in 1925 as a first formulation of quantum mechanics. This did not at first receive general acceptance due to the abstruse mathematics and lack of visualisation of the particles.

In Matrix Mechanics the physical quantities are not ordinary variables but mathematical matrices. The electron is interpreted as a particle with quantum behavior using sophisticated matrix computations which introduce discontinuities and quantum jumps. The set of eigenvalues of the matrix representing the observable is the set of all possible values that that could arise as outcomes of experiments conducted on a system to measure the observable.



Werner Heisenberg (1901-1976)

There was a problem with Schrödinger's wave equation in the interpretation of the electron matter wave. Schrödinger saw this as a spreading out of matter which was rich in some regions and scarce in others. Max Born tackled this problem and deduced that this was a probability wave and that the matter was actually concentrated in points.

This provided a fundamentally new approach to particle physics. Physicist John von Neumann (1903-1957) developed a mathematical theory showing that Schrödinger's Wave Mechanics and Heisenberg's Matrix Mechanics were mathematically equivalent. The proving of this equivalence caused mathematician David Hilbert to remark: *"Physics is obviously far too difficult to be left to physicists and mathematicians still think that they are God's gift to science".*

Hilbert actually suggested to Heisenberg that he find the differential equation corresponding to his matrix mechanics. Had he done so he could well have discovered Schrödinger's equation before Schrödinger.

In a lecture on Reality, physicist-philosopher Peter Russell raised a chuckle from his audience when he banged Heisenberg and Schrödinger's heads together by declaring: *"Particles are the eigenvalues of a wave equation".*

Heisenberg met his wife Elisabeth Schumacher in 1937 at a concert where he was performing the Beethoven G major trio, and described his playing of the second movement as a continuation of the conversation with his ardent listener.

They married in the same year in Berlin. They had three sons and four daughters. Elisabeth took an active role in the children's musical education so that the family could perform as an ensemble. Heisenberg had an extensive repertoire with a particular interest in Beethoven and Chopin. He could play the Beethoven concertos from memory and would play Beethoven and Mozart concertos with Max Born on two pianos, the one scientist playing the piano part and the other the orchestral.

Heisenberg was awarded the 1932 Nobel Prize for his work on Quantum Mechanics. He used part of the prize money to purchase a Blüthner grand piano which had come from the production series that had won Blüthner the first prize in the 1910 world exhibition in Brussels.

In his Nobel Laureate address, Heisenberg mentioned the non-visualisability of

John von Neumann (1903-1957)

particles: *"However the development proceeds in detail, the path so far traced by the quantum theory indicates that an understanding of these still unclassified features of atomic physics can only be acquired by foregoing visualization and objectification to an extent greater than that customary hitherto. We have probably no reason to regret this, because the thought of the great epistemological difficulties with which the visual atom concept of earlier physics had to contend gives us the hope that the abstracter atomic physics developing at present will one day fit more harmoniously into the great edifice of Science."*

Heisenberg is probably best known for his uncertainty principle which states that is impossible to know precisely the position and momentum of a particle at the same time. This was to have profound implications for future developments in particle physics. Einstein was not comfortable with the uncertainty principle and wrote to Max Born in 1926: *"Quantum theory is very impressive but an inner voice tells me that it is not yet the real thing. The theory yields a lot, but it hardly brings us any closer to the secret of the Old One. In any case I am convinced that He does not throw dice."*

Lucasian Professor Stephen Hawking responded with: *"Not only does God play dice, He sometimes does not let us see where He has thrown them."* Niels Bohr added: *"Einstein, stop telling God what to do!"*

There was to be yet another huge problem to confront theoretical physics – quantum entanglement. This claimed that entangled particles or photons would continue to instantly influence each other, even when separated by a great distance, without being delayed by the speed of light. Einstein did not like it and called it *"spukhafte fernwirkung"* – spooky action at a distance.

The 20th century continued with astonishing developments in experimental and theoretical physics. A notable milestone was the discovery that protons and neutrons consist of smaller entities known as quarks, which come in several different configurations. Another development is string theory which claims that the ultimate particles consist of infinitesimally small strings vibrating in various modes.

Entanglement is here to stay. Are we to think the unthinkable and seek a new theory of entanglement, electromagnetism and gravity from a perspective where space and time can be viewed as illusory quantities? WN

October

"There is no season when such pleasant and sunny spots may be lighted on, and produce so pleasant an effect on the feelings, as now in October."
- *Nathaniel Hawthorne*

COMPILED BY | JANE BUISSON-STREET
SMSAIEE | PMIITPSA

1 October

1869 The Austrian Postal Administration issued the world's first postal card, known as a Correspondz Karte. Dr Emanuel Hermann had "invented" them as an inexpensive way for soldiers to keep in touch with home.

2 October

1903 The first large capacity steam turbine to be used commercially was brought online at the Fiske Street Station of the Commonwealth Edison Company, Chicago, Illinois, USA. The turbine developed 6,500hp operating with steam at a pressure of 175lbs/sq.in. and a temperature of 375deg.F.

3 October

1941 Chemist Lyle D Goodhue and entomologist William N. Sullivan from the US, filed a patent application for the first aerosol. It was titled a "Dispensing Apparatus" and to be used to apply oil-free insecticides in mushroom houses.

4 October

1582 This was Thursday; the last day of that Julian calendar was used in Italy and three other Catholic states (Spain, Portugal, and the Poland). The next day was Friday, the 15th October 1582; the beginning of the Gregorian calendar which was established by Pope Gregory XIII. Ten days had been skipped to realign the calendar, and Easter, with the equinoxes.

5 October

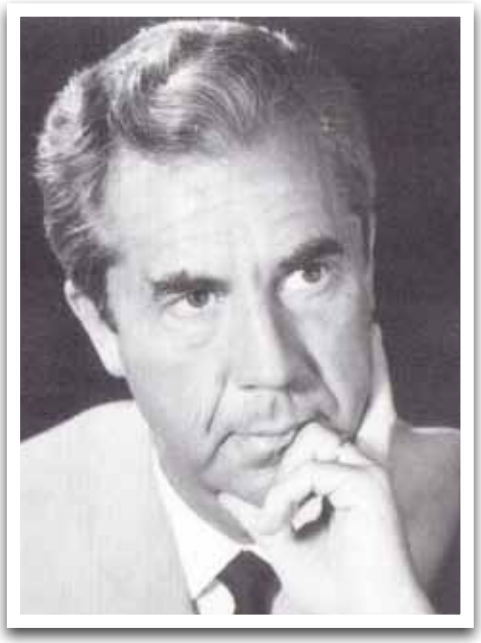
1923 Edwin Hubble identified the first Cepheid variable star.

6 October

1941 Chester Carlson patented electric photography now referred to as xerography or photocopying.

7 October

1970 The first big oil find in the British sector of the North Sea was made by BP's Sea Quest drilling platform. The oil was found 2,135m below the seabed and is a valuable light crude, with low wax and sulphur content.



8 October

1958 Dr Åke Senning, a pioneering Swedish cardiac surgeon, implanted the first internal heart pacemaker.

9 October

1946 The first electric blanket was manufactured by the Simmons Company of Petersburg, Virginia, USA. The temperature was regulated by an "electronic" thermostatic control and cost $39.50.

10 October

1933 Procter & Gamble launched the first washing powder, with synthetic surfactants, for home use. For the previous 2,000 years or so, soap had been used to clean clothes (rather unsuccessfully in hard water areas).

11 October

1841 John Goffe Rand (a portrait painter and inventor) patented his collapsible tube. This invention meant that artists could now store and transport their paint.

12 October

1823 Scotland's Charles Macintosh began selling raincoats (Macs).

13 October

1884 Greenwich was adopted as the prime meridian (the reference line for Universal Time).

14 October

1863 Alfred Nobel was granted his first patent, a Swedish patent for the preparation of nitro-glycerine.

15 October

1939 Helmut Schreyer (German electrical engineer and inventor) said, in a memorandum, that it would be possible to build a computer with vacuum tubes that would process "10,000 operations per second."

16 October

1953 Fidel Castro sentenced to 15 years (Havana).

17 October

1888 Thomas Edison files a patent for the Optical Phonograph (the first movie).

18 October

1878 Electricity was made available for household usage by Thomas Edison.

19 October

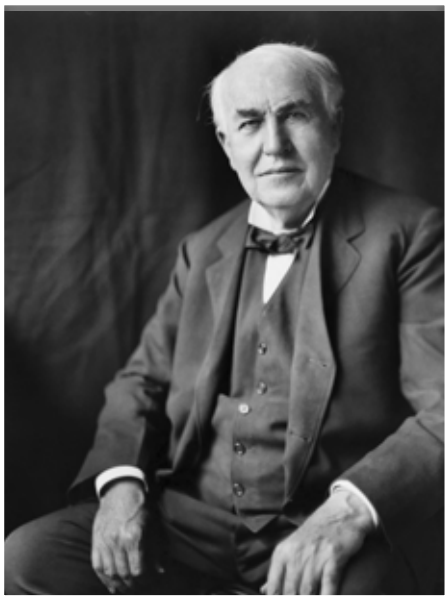
1872 A slab of slate in New South Wales, Australia, was found that contained 82.11kg of gold. Known as Holtermann's Nugget, it was largest mass of reef gold ever found.

20 October

1908 King Leopold II sells Congo to Belgium.

21 October

1895 It was reported that Carl von Linde, a German chemist, had invented liquid air for use in mechanical refrigeration.



22 October

1879 Thomas Edison perfects carbonized cotton filament light bulb.

23 October

1824 The first steam locomotive is introduced.

24 October

1926 Harry Houdini's last performance, which was at the Garrick Theatre in Detroit, Michigan.

25 October

1400 Geoffrey Chaucer, the courtier, diplomat, civil servant and poet, died at his home in the gardens of Westminster Abbey.

26 October

1988 The blockbuster film, "ET", was released to home video with 14 million copies being presold.

27 October

1962 US performs nuclear test at Nevada Test Site.

28 October

306 Mark Aurelius Valerius Maxentius proclaimed emperor of Rome.

29 October

1971 Surgeons at the University of Pennsylvania report the first successful use of electricity to repair a bone fracture.

30 October

1986 The first fibre-optic cable across the English Channel began service.

31 October

1951 The zebra crossing was first introduced in Slough, Berkshire, England to reduce casualties at pedestrian road crossings. wn

IN MY OPINION : JACO CRONJE

Africa's industrial scenario

Recently released facts and figures regarding industrial, business and economic growth in Africa paint an optimistic and encouraging outlook. However, there is of course the other side to the coin. To see only a buoyant picture would be exceedingly one-sided.

BY I JACO CRONJE I PR.ENG I B.SC (ELEC & COMPUTER ENG)

Reality and challenges need to be faced and a balanced perspective reached. It is the objective of this paper to examine the issues involved, achieve an objective viewpoint and consider the most appropriate steps industry players in Africa should take going forward.

UPBEAT PROSPECTS

Africa's growth is projected to accelerate to 4.8% in 2014 and 5 to 6% in 2015, levels which have not been seen since the global economic crisis of 2009. Africa has weathered internal and external shocks and is poised to achieve healthy economic growth rates.

This is according to the African Economic Outlook (AEO) Report 2014, published by the international forum comprising the African Development Bank (AfDB), the OECD Development Centre and the United Nations Development Programme (UNDP). The report is produced annually.

The 2014 report which focuses on "Global Value Chains and Africa's industrialization", advocates Africa's integration into global value chains which "hold the promise of boosting employment and structural transformation in Africa".

The key objectives of the AEO exercise are to broaden the knowledge base on African economies and to offer valuable and evidence-based support for policymaking, investment decisions, and donors' interventions. [1]

Supporting this upbeat outlook and providing similar figures is the United Nations (UN) World Economic Situation and Prospects 2014 (WESP) report. It states: *"Africa's economic growth prospects remain "relatively robust" and are expected to be supported by improvements in the global economic and regional business environment, rallying commodity prices, easing infrastructural constraints and swelling trade and investment ties with emerging economies."*

Figures provided by the UN WESP report are similar to those of the AOE and therefore also back the information the AOE has released. UN WESP says that Africa's growth is projected to accelerate to 4.7% in 2014 and 5% in 2015. This follows an estimated gross domestic product (GDP) growth of 4% in 2013.

OPPORTUNITIES & INITIATIVES

According to Mbendi Information Resources based in South Africa, Africa's industrial opportunities include:

- infrastructure and transport (pipelines, roads, telecomms);
- oil and gas (Angola and Libya);
- mining (West and Central Africa);
- international trade (oil producers and SADC)

Mbendi states that currently the following initiatives are taking place in Africa:

- Projects in Africa (758)
- Companies and Organisations in Africa (167 714)

- Products, Services and Suppliers for Building, Construction and Civil Engineering in Africa (818)

PERVASIVE CHALLENGES

Against this encouraging backdrop are however numerous challenges, such as under-developed financial sectors, political risks and instability, bribery and corruption, issues pertaining to public/private co-operation, and lack of first world technology and trends, to name but a few.

More general issues are inadequate knowledge about Africa and understanding of its culture.

Tielman Nieuwoudt, Principal of The Supply Chain Lab based in South Africa, which focuses on supply chain solutions in emerging markets, comments: "Words like inefficiency, bottlenecks, bureaucracy, corruption, poor infrastructure and even 'chaos' tend to be used when African supply chain management is being discussed." [2]

Dianna Games, an executive member of the Nigeria South African Chamber of Commerce in Johannesburg, and Chief Executive of business consultancy, Africa At Work, is familiar with the complexities and pros and cons of business in Africa. She points out some of the challenges the continent faces.

She refers to World Bank's Doing Business index which tracks ten business indicator sets: *"starting a business; dealing with construction permits; getting electricity; registering property; paying taxes; trading across borders; getting credit; protecting investors; enforcing contracts; and resolving insolvency."*

It is clear from the following comment Games makes that these are without doubt some of the key challenges Africa faces: *"Looking at changes to the African rankings in the World Bank's Doing Business index over the years, it is remarkable how few changes have actually been made in Africa, with regard to the ten indicators that the index tracks. This is especially noticeable in the poorest countries, which most need to improve their regulatory and operating environments."* [3]

CULTURE

A key issue affecting industry and business in Africa is that of culture. It is vital to gain an understanding of the local culture, context, facilities and means, take these factors into consideration and adapt accordingly. For example, means of transport are completely different from those in first world countries.

It is necessary to adopt a different strategy to each individual country. There is a tendency to group all African countries into the same category. While there are indeed similarities there are also significant differences from country to country and region to region, and it is essential for any executive doing business in Africa to understand how these similarities and differences will impact on their business.

Africa's Industrial Scenario

continues from page 59

Cultural considerations incorporate:

- Greetings, way of talking, word nuances.
- Language barriers: English, French, Portuguese etc.
- Domestic transport is very unreliable and it takes significantly longer to cover distances from country to country in Africa compared with similar distances in Europe.
- Time has a different concept in Africa to the West. Relationships, class and authority dictates timing, as opposed to Greenwich meantime.
- Education contributes directly to the advancement of the country. This influences skills, general understanding of the environment, the world and sustainable business.

FACTORS HINDERING BUSINESS AND INDUSTRY IN AFRICA

An overall perspective on the pervasive challenges in Africa has been given, and cultural issues affecting industry and business have been discussed. These challenges and cultural issues are very relevant to the factors hindering industry and business in the continent, which are outlined below:

GENERAL

- Lack of accurate information about Africa.
- The race to be Africa's leading economy pegs countries against each other instead of unifying the continent.
- Organisations such as South African Development Community (SADC) and the African Union (AU) do not adequately contribute towards easier trade and development environments across the continent. However, government partnerships between embassies are of great practical assistance.
- Bureaucratic processes slows down development opportunities.

TECHNICAL CHALLENGES

- Locally supported solutions are not linked to global trends.
- Sustainable engineering is not a key focus.
- Lack of infrastructure and technology, although in areas such as telecommunications and energy, Africa is able to use new technologies to leapfrog earlier development in other countries.
- African in-fighting, instead of improving infrastructure and technological advancements, embattles itself in power struggles.
- Procurement is conducted differently.

POLITICAL INSTABILITY

- Political stability drives investors and effects travel (e.g. Rwanda Embassy March 2014; Nigerian travel debacle June 2012).

FINANCES

- Finances are limited.
- Financial discussions are not regulated, and it is all down to negotiations.
- Fluctuating currencies.

FIRST WORLD CONTRIBUTIONS OR LACK THEREOF

- Technology companies spend money on training, trade shows and proof of concepts in the west while not supporting the developing countries. As a result, the understanding of latest technologies and implementation thereof lags behind the rest of the world.

CORRUPTION

- Corporate Governance is not adhered to.
- Facilitation fees, bribes and grease payments abound.

CHINA

Chinese influence is strong. Seeing fewer investment opportunities in their home countries, Chinese corporates are setting up shop in Africa. According to recent reports there are "thousands of such firms already in Africa". Chinese development in Africa is not lead by any other country to the same scale. However in many cases the sustainability of the investment is not there. There is apparently little skills development locally and many products are non-compliant and not in accordance with international standards and best practices.

CONCLUSION

The following quote from MBendi sums up the situation in Africa well: "While many write off Africa as the continent of despair, other enterprising individuals and organisations have recognised the huge, untapped potential of Africa and are actively pursuing business ventures across the continent."

To make a success of the potentially upbeat scenario, industry and business players should take into account and welcome the current opportunities. From here on out they should be totally committed to gaining knowledge and experience of the challenges inherent in industrial development in Africa, and consistently and purposefully deal with and work through them. This progress can translate into positive trends such as creation of sufficient jobs and a significant improvement of quality of life throughout Africa. The overall result could be rewarding industrial and economic growth prospects and development of infrastructure to the benefit of all.

It is crucial that a win-win situation be achieved by both those pursuing business

opportunities across borders as well as citizens resident in countries belonging to the greater African continent.

Irrespective of race, we are born Africans and believe in the prosperity of Africa for all of her people. The continent is abundant in natural resources and beauty, which can only be tapped in a sustainable all-inclusive manner. Africa is our home. wn

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[2] Tielman Nieuwoudt, Principal of The Supply Chain Lab, Johannesburg, South Africa (Feb 2013)

[3] "Protecting their patch more important than improving lives", by Dianna Games (Nov 2013): www.africaatwork.co.za .

Watt's your Opinion?

Please submit your comments or your own opinion piece to minx@saiee.org.za.

Calendar of events

OCTOBER 2014

15-16	Fundamentals Of Power System Load Flow	SAIEE House, Johannesburg	www.saiee.org.za
21-22	High Temperature Low Sag Overhead Line Conductors	Durban	www.saiee.org.za
22-23	Technical Document Writing For Engineers	SAIEE House, Johannesburg	www.saiee.org.za
29-30	Photovoltaic Solar Systems	SAIEE House, Johannesburg	www.saiee.org.za
30	Electric Arc Flash Safety	Cape Town	www.saiee.org.za

NOVEMBER 2014

1	SAIEE Annual Banquet	Wanderers, Johannesburg	www.saiee.org.za
4	Electric Power Cable Tutorial	SAIEE House, Johannesburg	www.saiee.org.za
4-7	CSP Focus 2014	Cape Town	www.saiee.org.za
11-12	Fundamentals Of Practical Lighting Design	SAIEE House, Johannesburg	www.saiee.org.za
20	SAIEE National Student's Competition	NMMU, Port Elizabeth	www.saiee.org.za

Transportation Technology

If my father is to believed the evolution of transportation has only benefited recent generations. "When we were young we walked for miles to school, church, and the shops - often in knee high snow!"

BY I ANGELA PRICE

Family photos prove that my father's family did own a car but in his tales it oddly seldom makes an appearance.

My father's reminiscing made me think about the various modes of transport that I have experienced over the past 36 years.

I guess one of my first forms of 'transport' was not mechanical. I could often be found stuck to my nanny's back like a limpet as she lovingly carried me around, secured to her with a tightly wrapped blanket.

Here in Africa we give little thought to this relatively safe method of transporting children. However whilst trying to help a Zimbabwean woman carry her child and luggage off a flight in the UK, I was told that she dare not tie the child to her back with a blanket because a previous attempt had resulted in her being hauled aside and lambasted by the police who started citing safety and security standards.

Prams are the typical method of transporting babies and small children, and they too have seen some technological advances - from the giant wheeled perambulators of past to the itsy-bitsy-fold-up-and-go devices that appear smaller than the baby itself and defy all rules of ergonomics.

If memory serves me correctly my next form of transport was my own 2 legs - not in knee deep snow mind you. But we walked, to school and back, to the local shops and parks and to our friends' house and thought nothing of it. These days it's sadly the last thought to cross my mind, the idea of my children 'just popping down the road' to a friend's house seems inconceivable.

Next came the bikes, good old Raleigh's and BMX's - many having been subjected to our own versions of 'pimp my ride'. The irony now is that kids' bikes seem to have far fewer components and cost a fortune.

Thankfully high school was too far to walk or ride to so we progressed to public transport - busses. I was struck the other day by the fact that I never see public busses transporting school children, possibly I am not on the roads at the right times but I do wonder how they all get around... they sure aren't walking.

At various times in my youth I was fortunate enough to have several trips overseas. I distinctly recall my first attempt at sleeping on an overnight flight - back then we were allowed to sleep on the floor at our parent's feet. It took about 3 hours for the imprint of the floor bolts to fade from my cheek! Sadly I can't report that recent air travel has been any more comfortable, in a strange Alice In Wonderland like experience the seat dimensions seem to have shrunk as I have 'grown…up'.

Whilst mentioning aeroplanes one has to think back to the nail biting journey to the airport along the highway that was all too often backed up with rush hour traffic, that journey in itself would often undo any relaxation you were yet to experience on your much anticipated holiday. And now we have the Gautrain! I can't help but feel very chuffed and 'cosmopolitan' as I bullet to the airport watching the startling diversity of Sandton CBD and Alex fly past the windows - backwards.

My personal daily mode of transport has evolved from my first student car (for which I paid R 5000) to my current 7-seater mommy wagon - the only thing missing now is a stick family plastered along the back window.

Whilst cars, planes and trains have not changed hugely in shape over the years - what's under the hood, building, propelling or monitoring them most certainly has, mostly thanks to the invention of the computer. I can't begin to conceive the changes my children will see in their life time in the realm of transportation, quite likely their first car won't even use petrol - I just hope it doesn't fly! wn

RobMech2014

27 - 28 November 2014
Lagoon Beach Hotel Cape Town

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The 25th annual symposium of the Pattern Recognition Association of South Africa (PRASA) will be held in conjunction with the 6th Workshop on African Language Technology (AfLaT) and the 7th conference of Robotics and Mechatronics (RobMech) on 27 and 28 November 2014 at the Lagoon Beach Hotel in Cape Town.

In addition to PRASA, AfLaT and RobMech, the 11th FASTAR workshop will take place on 24 and 25 November in Stellenbosch to make provision for interested parties to attend all four events. Visit www.fastar.org for more information on this workshop.

FEES

No fees are payable by delegates that attend and present.
However, delegates attending, but not presenting, incur a cost of R1,000 per delegate (subject to change if additional funding is secured).

Registration is limited to 150 delegates, and the conference dinner is limited to 100 on a first come first serve basis. Delegates are responsible for their own accommodation and transport.

Registration will open in October, authors of accepted papers are registered first.

IMPORTANT DATES AND DEADLINES

22 September 2014
The deadline for the submission of full papers/ abstracts for work-in-progress/posters.

1 October 2014
Conference registration opens.

21 October 2014
Notification of acceptance of papers and abstracts will be provided to authors via e-mail.

1 November 2014
Deadline for registration.

14 November 2014
Final date for submission of camera ready papers.

RobMech 2014 Conference Secretariat

Email: robmech2014@gmail.com
info@aflat.org

Conference websites:
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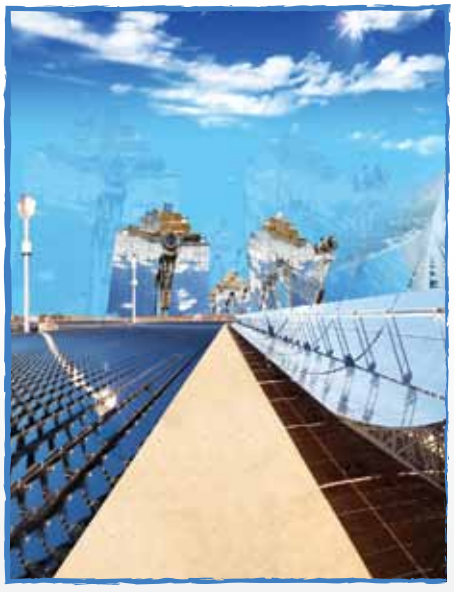
Day 2 Nov. 7, 2014	Morning	Suggestions from World Famous EPCs
	Afternoon	Technology Innovation & Cost Reduction



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