wattnow

THE SAIEE CHALLENGE: THE WORLD IS CHANGING

RSA | R30.00 incl. VAT

LIGHTING

SAIEE THE OFFICIAL PUBLICATION OF THE SOUTH AFRICAN INSTITUTE OF ELECTRICAL ENGINEERS | NOV/DEC 2018

Superior quality LED products manufactured in South Africa.

ECON LED offers a wide range of **high end LED products** for both the individual and industry. With 6 years production experience we are able to offer expert advice and solutions.

- Our products carry a **warranty of up to 5 years**
- With our after sales service your product could last a life time
- All our components are **100% replaceable**
- We are a **level 2 BEE** company
- **SANS** and **IEC** tested

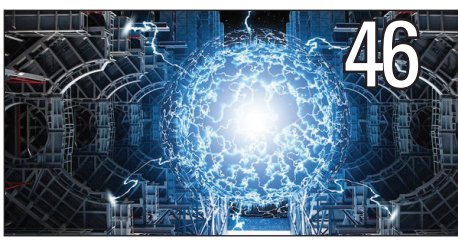
SUPPORT LOCAL

www.econled.co.za
T. +27 11 979 5124 | **E.** barry@econtrading.co.za

ECON LED industries
compromising on quality is not an option.

contents

FEATURES



GENERAL

REGULARS

SAIEE @saiee

wattnow

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

TECHNICAL EDITORS
Jane-Anne Buisson-Street
Viv Crone
Thavenesen Govender

CONTRIBUTORS
A Deodhar
I Phafula
M Hlakudi
D Basson
F Catlow
J Buisson-Street

EVENTS
Gerda Geyer I geyerg@saiee.org.za

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

MEMBERSHIP & TECHNOLOGY LEADERSHIP
Connie Makhalemele Maseko I connie@saiee.org.za

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

PUBLISHER
South African Institute of Electrical Engineers

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

ISSN: 1991-0452

2018 Q2 - 15 811

Firstly, let me apologise for the lateness of this issue, but if you bear with me, and start going through the news pieces, you will see why.

The SAIEE hosted its annual banquet where we recognised members of the electrical engineering fraternity for their contributions to our industry. It was an evening to remember.

Wits University hosted the SAIEE's 2018 National Student's Project Competition a few weeks ago. The calibre of the entries astounded the judges stumped. All the participants were winners in my book, but alas, there could only be one winner in each category.

The social pages are full of information about the industry happenings in the last few weeks.

Earlier this month I had the privilege of visiting Russia as a guest of Rosatom. I had planned on sharing my story in this issue but have run out of time. Watch out for the January issue where I will share my experiences.

This issue features Lighting - and especially in our current load-shedding climate - it's quite apt and I believe we can learn something from our feature article. "Intelligent Buildings", written by Aniruddha Deodhar, who is the Principal, Connected Spaces at ARM, where he is responsible for driving ARM's IoT solutions strategy for Smart Buildings and Smart Cities. He talks about how the United Nations expects that two-thirds of the world's population will live in cities by 2030 and the need for real-time data that helps new urban populations thrive will grow exponentially. Find it on page 30.

Pages 36 and 40 showcase the two winning essays of the IEC Young Professionals Programme who represented South Africa at the IEC General Assembly in South Korea, Busan, during October 2018.

To all my readers and contributors, wherever you might find yourself in the world, I want to thank you from the bottom of my heart for your diligent following of the **watt**now, your valued contributions during 2018, your letters, your compliments and even those emails of enquiring when the issue will be online! You all make a huge difference in the success of the **watt**now. Here's wishing you a fantastic festive season and may all of your dreams come true in 2019.

Here's the November/December issue, enjoy the read!

Minx

Visit www.saiee.org.za to answer the questions related to these articles to earn your CPD points.

The future of Lightning Protection is here...

Independent Earthing & Lightning Protection Consultants

Lightning Protection Concepts (LPC) is an independent and innovative consultancy firm established to provide local organisations with unsurpassed, highly comprehensive and innovative solutions and services to assist the market with its earthing and lightning protection requirements.

LPC is led by Trevor Manas and Alexis Barwise, both passionate about saving lives and protecting assets. They have been demanding safety and compliance for over 35 years on 5000+ projects in the field of earthing, lightning protection, surge protection and electromagnetic compatibility.

LPC now offers the market a comprehensive range of design, consultancy and training services, including:

- Lightning risk assessments including mitigation methods
- Site compliance assessments including correction measures
- CPD accredited seminars for engineers and installation training for installers
- Conceptual and detailed lightning protection system (LPS) designs including both 2D and 3D layout formats.
- Detailed earth-termination system (ETS) designs including software-aided simulations for ground potential rise (GPR) and permissible step and touch voltages.

LPC
LIGHTNING PROTECTION CONCEPTS

Get Protected - Call LPC for Effective, Innovative and Compliant Protection Solutions

Tel: +27 (0) 83 377 2844 / +27 (0) 66 272 1044 • E-mail: info@lpconcepts.com • Web: www.lpconcepts.com

DR HENDRI GELDENHUYS
2018 SAIEE PRESIDENT

2019 Appointment of new SAIEE CEO

We are entering a new era which requires a new leadership team to transform the SAIEE into the evolving future. The SAIEE Council has approved the recruitment of a CEO in August 2018, which kicked off the process of inviting candidates to apply for the post. We received 16 applications.

Office Bearers of the SAIEE compiled a short list of the best candidates from the 16 applicants. The shortlisted persons were invited for interviews which took place on Friday 19 October 2018. The complete team of Office Bearers conducted the interviews. A ranking of the candidates was determined which was unanimously agreed to by all of the Office Bearers.

The list was presented to the SAIEE EXCO (which has the authority and accountability for appointing the CEO) on 2 November for approval to negotiate with the candidates in order of ranking with the task to conclude a CEO contract with the best suitable and available person. These negotiations took place during November 2018.

SAIEE presented an offer of employment to Sicelo Xulu who has duly accepted the offer. On Friday 30 November the SAIEE EXCO sanctioned the appointment.

Sicelo Xulu is a Fellow of the SAIEE. He has served as President of the AMEU from 2014 to 2016. Sicelo is a PrTech and is a Certified Director with the Institute of Directors of SA. He has a B-Tech in Electrical Engineering from the Central University of Technology, a BSc Honors from the University of Pretoria and an MPhil in Electrical Engineering (Cum laude) from the University of Johannesburg. He has done an Accelerated Directorship Program with IoDSA and the Executive Development Program and Municipal Finance Management Program with the Wits Business School.

Sicelo worked in a range of Electrical Engineering capacities starting his career in Eskom in 1995. He joined City Power in 2002 where he worked his way up the ranks to become the CEO of City Power in 2012 up to August 2017.

Throughout the recruitment process, we have been aware of the media reports around Sicelo when he left City Power as CEO. We were aware of the potential reputational risk to the organisation and also the perceptions that our stakeholders may hold because of the recent events in our country. Of equal importance to us, was to conduct a fair and ethical process in evaluating each candidate, guided by the following framework:

- To appoint the best (most suitable) person in the post.
- Fairness to all candidates.
- To consider available proven evidence.

The SAIEE has been blessed with the services of Stan Bridgens for the last 12 years as CEO. Stan has built a strong administration team that ensures that the SAIEE runs efficiently. I want to express my sincere appreciation to Stan and the SAIEE administration team for the excellent work they are doing.

An easy option would have been to quietly sideline applicants considered risky or difficult to evaluate. This would have allowed us to conclude the process and not have to explain our decision. This was an option that Office Bearers did not take as it would be in our view unethical and unfair to persons in such situations, it would even allow unfair acts of the past to have a lingering effect.

During the recruitment process, we had access to several reports that were compiled around the matter. We considered all the evidence available to us with great care and had concluded as follows:

- No written/ investigated allegation/charges were found to imply that Sicelo has acted fraudulently.
- All the allegations were formally investigated and were of a technical administration nature. Of the many allegations, the vast majority were found to be invalid.

After serious investigations, intense interviews, assessments and consideration by the panel, Sicelo was appointed as the best candidate for the post. References close to Sicelo have indicated that he is a trustworthy and competent person. No proven evidence could be found that he has acted fraudulently in his previous job.

We wish Sicelo all of the best in his new role as SAIEE CEO, and we trust that he will enjoy the challenge and help the SAIEE negotiate the changing environment we live in with great success!

To all our readers, here's wishing you a very prosperous festive season and a succesful 2019!

Warm regards

P Goldenhuys | SAIEE President 2018
FSAIEE

SAIEE 2018 ANNUAL AWARD WINNERS

This year the South African Institute of Electrical Engineers's hosted it's 107th Annual Banquet, a Masquerade Ball, at the Midrand Conference Centre on the 26th October 2018.

The Master of Ceremonies was funnyman Loyiso Gola, and Bapetikosweti's former ambassadress, Evita Bezuidenhout, was evening's entertainment who had the guests in stitches and, literally, had makeup running off faces of some of the guests.

The 2018 Award and winners are:-

ENGINEER OF THE YEAR AWARD

- sponsored by Actom

From left: Greg Whyte (Actom), Pascal Motsoasela and Dr Hendri Geldenhuys (SAIEE President).

This award recognises an SAIEE member who has energetically and voluntarily worked towards promoting electrical science and its applications for the benefit of its members and the Southern African community.

The deserving winner of the 2018 SAIEE Engineer of the Year is Pascal Motsoasela.

Pascal, a Senior member, who joined the SAIEE in 1999, serves on the SAIEE Council and various Committees. He has more than 15 years' post qualification experience in technology research, testing, development and demonstration in the electric utility industry. In the past two years, he has specialised in the automation asset management area in the water utility industry.

The focus of his career has been the researching of utility communication technologies, the testing of commercially-off-the-shelf technology products and conducting technical investigations.

The valuable contributions of his time, effort and expertise to our noble Institute makes him a deserving candidate for the Engineer of the Year Award.

THE SAIEE ENGINEERING EXCELLENCE AWARD

- sponsored by Fluke

This is awarded to a Member, Senior Member or Fellow who has excelled in Electrical Engineering and demonstrated above-average involvement in supporting the SAIEE with its aims and objectives as well in their capacity that supports and mentors those with whom they interact in the workplace.

The 2018 winner of the SAIEE Engineering Excellence Award is Professor Jan de Kock.

Jan is a Professional Engineer, who became a member of the SAIEE in 1986 and currently serves as an elected Council Member for the past four years. His dedication to attending Council meetings from far and his contribution to bringing the North West University and SAIEE closer together makes him the ideal candidate for this award.

From left: Francesco Pagin (Fluke), Prof Jan de Kock and Dr Hendri Geldenhuys (SAIEE President).

He is a Fellow of the Institute and serves on various Committees. Further he is a stalwart of the SA Universities Power Engineering Conference for many years.

Jan supports the SAIEE CPD Programme in sharing his wealth of academic expertise. He has vast industrial experience in the design, commissioning, and performance assessment of generators and synchronous machines.

THE SAIEE PRESIDENT'S AWARD

This prestigious Award recognises significant contributions in any sector of electrical, electronic, telecommunications and computer engineering in South Africa.

From left: Dr Hendri Geldenhuys (SAIEE President), and Chris Yelland.

From left: Bernard Meyer (SGB-SMIT POWER MATLA), Tsego Cornelius and Dr Hendri Geldenhuys (SAIEE President).

From left: Dr Hendri Geldenhuys (SAIEE President) and Joyce Mtimkulu, Chairperson, Western Cape Centre.

The 2018 SAIEE Presidential Award winner is Chris Yelland, who is reknown for his excellence in electrical and electronic engineering reporting.

Chris is known for his in-depth analysis of critical issues in the electrical and electronic engineering spheres. His company, and publications, are recognised for their excellence in investigative as well as technical reporting.

He has fearlessly questioned and reported on sensitive matters in our industry for more than three decades. He is a widely recognised face and voice on national television and radio who comments around electronic and electrical engineering issues, and has won several awards throughout his illustrious career.

Chris Yelland, a SAIEE Fellow, became a member of SAIEE in. He is also a Senior Member of the Institute of Electrical and Electronics Engineers (USA), and a Member of the Institution of Engineering and Technology (UK). He obtained a Bachelor of Science degree in Electrical Engineering from the University of Natal in 1976.

KEITH PLOWDEN YOUNG ACHIEVER'S AWARD

- Sponsored by SGB-SMIT POWER MATLA

The SAIEE annually awards the most outstanding Young Achiever of the year in the field of Electrical/Electronic engineering. What counts in this person's favour is their spirit of achievement, creativity and leadership in the workplace. Innovative, entrepreneurial actions and an infectious enthusiasm for success are the qualities exhibited by Young Achievers.

The 2018 winner is Tshego Cornelius. Tshego joined the SAIEE in 2004 and started her career in 2009 at the Eskom Transmission Western Grid. She presently serves as a Design Engineering Manager in the Electrical & Control and Instrumentation Department of Eskom.

Her passion for the development of other young people has seen her take up various leadership roles in ploughing back, paying it forward and championing women's voices, particularly in the Science, Technology, Engineering and Mathematics arena. She is very conscientious of the engineer's role in the community and is an avid role model to young SAIEE members, and it is no doubt that this remarkable Professional Engineer should receive this award.

SAIEE CENTRE OF THE YEAR AWARD

This is a new award that recognises our various Centres's efforts, which is based on specific criteria.

The winner of the 2018 SAIEE Centre of the Year is The Western Cape Centre.

Established in 1953, this Centre hosted four CPD training courses, ten lectures and organised one site visit. They graciously hosted SAIEE Corporate Partner, Fluke, in one of their Roadshow training seminars.

They had two articles published in the **watt**now magazine and have established two student chapters. They have been involved in six CSI initiatives and submitted their monthly reports diligently every month, and all this was done on a voluntary basis during 2018.

The SAIEE congratulate all this year's winners and are immensely proud of all of these achievements.

WATTSUP

2018 SAIEE ANNUAL MASQUERADE BALL

SAIEE President, Dr Hendri Geldenhuys

The enigmatic, Tannie Evita Bezuidenhout.

SAIEE CEO, Stan Bridgens stayed in theme!

SAIEE Past President, Marie Davison receives her 50 year Membership Certificate from Hendri Geldenhuys.

From left: Paddy Padayachee, Dawie & Sy Gourrah, Pascal Motsoasele and George Debbo.

Zola Ntsahngase & Veer Ramnarain.

MC - Loyiso Gola.

From left: Stan Bridgens, Jacob Machinjike, Chris Yelland, Pat Naidoo and Hendri Geldenhuys.

Giullum & Jane Buisson-Street.

TC Madikane & Prince Moyo in deep discussion.

From left: Refilwe & Tiro Mokogosi and Elmarie & Hendri Geldenhuys.

Viv Crone & Jacob Machinjike.

The UL South Africa Team arrived in high spirits.

Of course the SAIEE Banquet will not have been a huge success without the support of industry and our dedicated sponsors. They are, in alphabetical order:
Actom - Award Sponsor;
ATNS - Red wine sponsor;
Fluke - Award Sponsor;
Lightning Protection Concepts
- Gift sponsor;
MCorp - **watt**now table sponsor
Proconics - White wine sponsor;
Rosatom - Flower sponsor;
SGB-SMIT POWER MATLA - Award Sponsor;
Shumani Mills - programme sponsor; and
UL South Africa - VIP Photobooth sponsor.

WATTSUP

NOW FOR SOME FUN VIP PHOTOBOOTH PHOTOS

- Sponsored by UL South Africa

I truly appreciate everyone's effort in having fun at the banquet. These following photos leave you with a happy feeling to see we haven't forgotten how to have fun. If you want a copy of your photo, visit our website and download it from the Events calendar on www.saiee.org.za.

I took the liberty of NOT posting any names with the photos, for obvious reasons.... ED


PARTY
Cool
PARTY
Cool
SO MUCH FUN
GIVE US
WHAM!

WATTSUP

ACTOM Electrical Products' project supply business gets welcome boost from public sector projects

ACTOM Electrical Products' extension of its "complete product packages for projects" business in 2016 to include catering to projects in the public sector has contributed strongly towards its continuing success.

"We took a further step towards improving our strength in the public sector more recently, in 2017, by adding a comprehensive array of overhead line products to the rest of the range of products we offer and supply," said Mike Ullyett, Sales & Marketing Executive for ACTOM Electrical Products, which is the ACTOM group's distribution arm.

"Overhead lines, whether for electrical distribution, streetlights or others, form an important part of the majority of public sector projects. With these now included in our projects equipment line-up we offer all the key products required for most public sector projects."

The additional products, produced and procured by local companies pre-approved by ACTOM Electrical Products as suppliers, include surge arrestors, fused cut-outs, aerial bundle cable fittings, insulators and steelwork

ACTOM Electrical Products initially launched its project-orientated drive in 2010 with the main focus on private sector projects. *"However, due to the difficult economic environment, fewer private sector projects are being undertaken than in more normal circumstances, so public sector projects offer better opportunities at present,"* Ullyett remarked.

The public sector portion of ACTOM Electrical Products' project supply business has grown steadily since its launch in 2016. *"Not only are we winning orders for product packages for municipal projects via our extensive branch network, but we have also landed several supply contracts for projects by electrical utilities in some of the neighbouring SADC countries, as well as for Eskom."*

The bulk of the equipment supply contracts for public sector projects are awarded by Engineering, Procurement and Construction Management (EPCM) contractors assigned to implement the projects on behalf of the end-users.

ATNS 7th AviAfrique Summit breaks barriers in aviation through collaboration

Air Traffic and Navigation Services (ATNS) Company of South Africa has successfully hosted its seventh annual AviAfrique Innovation Summit that once again created a platform for pan-African, organisation, and cross-industry stakeholder collaboration.

Breaking barriers in the aviation industry through innovation was the aptly themed summit once more hosted at Council for Scientific and Industrial Research (CSIR) International Convention Centre in Pretoria, South Africa, on October 23 and 24, 2018.

"This year we look at innovation in the context of digital aviation, which is increasingly important during a rise in global air passenger traffic," says Simphiwe Thobela, ATNS board chairman. *"During this unprecedented period passenger safety, security, and convenience are paramount. That makes innovation one of the most important considerations. More than four billion passengers put their safety in our hands. We must also remember that we contribute to the growth of global economies. Forums such as these help us explore ways to move forward in the digital age."*

Specific topics under review this year included collaboration between African Air Navigation Service Providers (ANSP), new technologies such as passive radars as well as drones, Unmanned Aerial Vehicles (UAV), Unmanned Aerial Systems (UAS), and Remotely Piloted Aerial Systems (RPAS), securing talent in aviation, how cybercrime affects aviation and safety, how aviation can harness innovative technologies to overcome challenges, and, most importantly, Collaborative Decision-Making (CDM) and how to achieve it across Africa.

Simphiwe Thobela, ATNS board chairman.

SAIEE Africa Research Journal to be indexed by IEEE Xplore

Prof Saurabh Sinha,
Deputy Vice-Chancellor:
Research and Internationalisation,
University of Johannesburg, South Africa |
Managing Editor, SAIEE Africa Research Journal

The proposal to include the SAIEE Africa Research Journal into IEEE/IET Electronic Library (IEL) (commonly referred to as "IEEE Xplore") started on 17 Jan 2012 with a letter to the then IEEE Staff Executive for Publications, Tony Durniak and IEEE Vice-President for Publication Services and Products Board (PSPB), David Hodges. The process followed deliberation through IEEE PSPB, IEEE Technical Activities Board (TAB), IEEE Finance Committee (FinCom) and eventually the IEEE Board; at the IEEE Board Series, Feb. 2018 – the indexing of SAIEE Africa Research Journal into IEEE Xplore was finally approved.

Behind the scenes, over a 4-year process, IEEE VPs for PSPB who played an instrumental role included - Gianluca Setti and Sheila Hemami – they organised an intensive technical peer-review of the journal to ultimately confirm that the peer-review publication process and peer-review followed by the SAIEE Africa Research Journal and that of IEEE Publications is synchronised and would yield the same result of manuscript acceptance. To ensure continuous professional development of the authors community, Jon Rokne, former VP for PSPB, volunteered time to contribute the slide deck (distributed through IEEE.tv):
https://ieeetv.ieee.org/mobile/video/best-way-place-to-publish-your-work-ieee

Separate from the publications and quality assurance process, IEEE Xplore embarks on a rigourous process for journal inclusion – here, the Xplore team led by Karen Hawkins (Karen Hawkins is now the IEEE Chief Marketing Officer), Renny Guida and Naveen Maddali are playing a progressive role. Working with IEEE Foundation, Inc., and with thanks to Karen Galuchie, Executive Director, an agreement was reached to fund the indexing of back issues 2004-2018 and as of 2019 – the new agreement for direct indexing by IEEE will occur of the SAIEE Africa Research Journal. The SAIEE Africa Research Journal publishes articles at least 3-months in advance and there is a business continuity plan (continuously implemented and in "real-time") – www.saiee.org.za/arj - availability of the journal as open-access will continue.

Another essential impetus into this process was brought about by the IEEE Ad Hoc Committee on Africa Activities (AHCAA), conceptualised by Moshe Kam, in 2011 and thoughtful direction ("good to great IEEE") of Matt Loeb (at the time, Loeb served as IEEE Staff Executive). AHCAA, and IEEE Board, in Nov. 2017, resolved for the 2019-2020 support for peer-reviewed publication activities and in support of the SAIEE Africa Research Journal: with thanks to the leadership of Vincent Kabunga, Gordon Day and of Kathy Weeks, IEEE Senior Corporate Development Manager, professional staff partner to IEEE AHCAA. In 2018, IEEE President and CEO, Jim Jefferies, signed SAIEE-IEEE agreement(s) formalizing the way forward.

The SAIEE Publications Committee, over 2017/8, took ownership of the process and the consequence is the upcoming indexing of the journal into IEEE Xplore – thanks to the leadership of Thavi Govender, Viv Crone (volunteer oversight over SAIEE-IEEE agreement(s)), and Stan Bridgens (SAIEE CEO).

SANEDI attends SGE cleantech trade mission

Representatives of the South African National Energy Development Institute (SANEDI) recently attended the CSIR-hosted Switzerland Global Enterprises (SGE) Cleantech mission to promote trade and R&D in the clean technology and energy efficiency industries.

There is a great demand for clean technology for various technologies, manufacturing processes and services that use available resources efficiently and/or help protect and maintain natural resources. According to Cleantech, Swiss companies are leading the way in clean technology worldwide.

"The opportunity to interact with world experts in these fields was an invaluable occasion and one that we welcomed," says Dr Thembakazi Mali, interim CEO at SANEDI.

"Our Renewable Energy Centre of Research and Development is specifically focused on support and coordination of renewable energy research and development throughout South Africa. SANEDI also strives to implement cleaner mobility solutions, focused mainly in cities and other niche markets." he added.

WATTSUP

Motivational Talk by SAIEE PES member at Chechema Secondary School

Prescious Mpepele, PES Member going back to her roots with a few of the Checema Secondary Scholars.

Thank you SAIEE.

Precious Mpepele (SAIEE Power & Energy Section [PES] member) recently visited Chechema Secondary School in Marowe Village, Limpopo province. The school has had poor matriculation performance, with 36% pass rate reported in 2017.

A local community based non-profit organisation, Marowe NPO, took it upon themselves to intervene through motivational programmes and resource needs identification/support, in order to assist the school to turnaround its performance. Precious was invited as one of the key note speakers to deliver a motivational talk to Grade 11 and 12 learners. The aim for the day was to bring people from various industrial sectors (i.e. engineering, medicine, banking/finance) to meet and encourage the learners to do better, to expose/familiarise learners to various possibilities.

Precious's contribution for the day was to introduce the pupils to the different engineering career fields, the different types of tertiary institutions (university, university of technology, and FET college) and qualifications offered (BScEng / BEng, ND, BTech, Vocational certifications).

Precious's lowlight for the day: *"…the lack of understanding what engineers do, and the lack of awareness amongst pupils regarding engineering vocational education and related job opportunities. Many of the learners there confided that they have not met an engineer - so engineering is somewhat an abstract career goal for them. Like many in South African rural areas; Marowe village is riddled with poverty and unemployment. There is no library, nor is there sufficient telecommunication infrastructure for learners to have access to internet for online scholarly research."*

"Learners are highly reliant on the learner/teacher contact for information and advancement, therefore a greater need for other professionals like you to play their part in being visible and accessible to mentor our children" said Chechema's Principal, Mr C Manthata.

"From this experience, I believe there is need to help learners to top up their classroom education with real life exposures. Learners need to be exposed at an early age, to various economic sectors (industrial, commercial, agricultural etc.) that contribute to the market value of our country's economy. By so doing we can inspire young minds, to open their eyes to endless possibilities, to shape directional thinking; nature their intrinsic motivation/confidence and eventually provide a gateway to best-class choices for their lives and livelihood" Manthata added.

SAIEE provided stationary and literature materials for distribution to the learners.

The local NPO donated sanitary towels to the school – for anyone interested to make a positive contribution to Marowe and Chechema community; contact 082 362 9091.

Grass, thatch, lightning and fire – a potentially deadly South African combination

Mothers, children, firefighters, and those in both formal and informal housing were all victims of last year's deadly Knysna fires. A separate image of a lone, partially-blinded horse walking along the N2 trying to get home summed up the devastation for many. These are just some of the reminders that return to the collective mindset when we think, nearly 18 months later, about the devastation caused by the Knysna fires of South Africa's winter of 2017 - fires that were most probably caused by the deadly combination of a lightning strike, tinder-dry vegetation and blustering berg winds.

This is according to a recently released report from the Council for Scientific and Industrial Research (CSIR). The commentary provides great detail about last year's deadly fires, which killed at least seven people and hundreds of animals, and which has been billed by the CSIR as "one of the worst fire disasters" in South Africa's history.

The insurance bill for the Knysna fires was enormous. With around 600 homes destroyed, and more than 10, 000 people displaced, initial estimates for damage to property came in at between R4 - 6 billion. It is a reminder of the need to protect your property – and with it the lives of your loved ones and animals – from the hugely destructive potential of a lightning strike.

Hano Oelofse, Technical Director at lightning and surge protection company DEHN Africa, says, *"South Africa is a country with a high lightning ground flash density. Vast areas of our terrain are prone to the high possibility of a lightning strike at different times of the year, potentially affecting residents in both densely populated areas as well as more rural areas."*

"A recent fire in the Pilanesberg National Park in September this year, which was apparently caused by human error, reminds us just how flammable dry grass really is." Oelofse explains that the nature of lightning protection for thatched roofs has changed with improvements in technology. *"DEHN Africa provides lightning protection system (LPS) components for use specifically on thatched roofs,"* he clarifies, *"and our high-voltage-resistant insulated (HVI) lightning protection system, which is compact and neat, removes the need to have a 30+ metre lightning rod installed to protect your thatched roof. It is far less visible to the naked eye than a mast, and therefore more visually pleasing for both the homeowner in an urban area, as well as the general environmental aspect in a game park."*

WATTSUP

SAIEE opens Northern Cape Centre

The Northern Cape Centre Committee.

The Northern Cape Centre Chairperson, Ben Mabizela.

November saw the SAIEE expanding on its 8 national centres, by opening a Northern Cape Centre in Kimberley. The newly elected Chairman, Ben Mabizela, was proud to introduce the working committee, as:
Deputy Chairperson – Molefi Rantsonyane;
Finance – Thandiwe Nkambule;
Deputy – Sydney Mukhawane;
Secretary – Shandukani Vhulondo;
Deputy secretary – Peet Van den Heever;
Media and Publicity – Mzi Nqcakani;
Document controller/Data storage – Michael Metebe; and
Organizing Committee – Phenyo Letong.

The launch was attended by SAIEE President Dr Hendri Geldenhuys, SAIEE CEO Stan Bridgens and SAIEE Operations Manager, Leanetse Matutoane. *"It is a great day for me to be the inaugural Chairman of this long-awaited centre, and we are geared in recruiting new members for the SAIEE and delivering to the engineers in our region"* Ben concluded.

SALUTES

Dr Hendri Geldenhuys, SAIEE President awarded a Fellow Membership Certificate to Prof Shyama Pada (Daniel) Chowdhury at the 2018 December Council meeting. Congratulations!

Engineered For Simplicity And Reliability

Suitable for a wide range applications such as time control, position indication, control of rotation speed and batch counting, the Hengstler Tico 772 multifunctional counter is extremely easy to use. Available from Countapulse Controls, this electronic preset counter has been engineered for simplicity as well as reliable operation and allows use by more than one individual.
For more info, visit ww.countapulse.co.za

SAIEE National Student Project Competition winners

The judges with the participating students.

From left: Stan Bridgens (SAIEE CEO), Dr Hendri Geldenhuys (SAIEE President) and BTech Winner, Gareth Gericke from the Central University of Technology.

From left: Stan Bridgens (SAIEE CEO), Dr Hendri Geldenhuys (SAIEE President) and BEng Winners, Brandon Verkerk and Christopher Maree from the University of the Witwatersrand.

The annual SAIEE Students Project Competition took place at the University of the Witwatersrand (Wits) during November. Prof Estelle Trengove, Head of School of Electrical & Information Engineering, Wits, officiated the opening. The excitement and apprehension were palpable in the Chamber of Mines Building while the participants were uploading their presentations.

The students did not disappoint in their excellent presentations. The judges, who were Dr Hendri Geldenhuys (SAIEE President), Stan Bridgens (SAIEE CEO), Leanetse Matutoane (SAIEE Ops Manager), Wayne Fisher (SAIEE Council Member) and Nomatshawe Gantsho (SAIEE Gauteng Centre Member), had a momentous task to decide on the respective winners.

In the BTech category, the winner is Gareth Gericke with his presentation "*Development of a Simulation and Emulation system of specialised motor vehicles*" who hails from the Central University of Technology in Bloemfontein.

The B Eng Category was won by Brandon Verkerk and Christopher Maree, from the University of the Witwatersrand, with their "*meterBlock: The Decentralised Energy Exchange for Open-grid Applications*" presentation.

In closing, SAIEE CEO Stan Bridgens commented: "*The National Students Project Competition has been an annual event on the SAIEE Calendar since November 1992, and every year the students surprise me with their innovation.*"

He added, *"every participant has delivered more than expected and we are truly grateful for the tertiary establishments represented here today for the great work the students are doing in the electrical and engineering space".*

We thank our sponsors Fluke and ATNS.

WATTSUP

Top CIO, IT Personality for 2018 named at IITPSA President's Awards

From left: Ulandi Exner (IITPSA President), Teddy Daka (Winner IT Personality of the Year) and Shashi Hansjee (Entelect).

From left: Tshifhiwa Ramuthaga (2017 CIO winner), Jacques Barkhuizen (Visionary CIO of the Year) and Ulandi Exner (IITPSA President).

From left: Aimee Clarke (Editor, EngineerIT), Dr Jackie Phahlamohlaka (Distinguished Service in ICT Award) and Thabo Mashegoane, IITPSA Vice President.

Etion's Teddy Daka and Absa's Jacques Barkhuizen have been named SA's IT Personality and Visionary CIO of the Year at the SA IT industry's top annual awards.

The annual Institute of Information Technology Professionals SA (IITPSA) 2018 President's Awards, presented in Sandton recently, celebrate the country's leading lights in ICT. With two new awards introduced in 2018, the event recognised five individuals and projects worthy of the industry's top accolades.

The IT Personality of the Year Award – IITPSA's oldest award, which is now in its 40th year – was awarded to Teddy Daka, Group CEO and major shareholder at Etion Limited. A global businessman, academic and philanthropist, Daka turned Etion from a loss-making engineering firm to a profitable AltX-listed digital technology business. He also founded Tedaka Investments and serves as the Global Chair of Aurecon.

In accepting the award, Daka noted: *"I'm just the guy in front. Behind me, there's a collective of over 400 people at Etion working to enhance humanity through technology."*

Jacques Barkhuizen, Absa CIO for Virtual Channels/Digital Banking, received IITPSA's Visionary CIO award for 2018. Barkhuizen's career spans over 28 years and includes serving as CIO of Deloitte Africa, Global CTO of Investec Bank, and CTO for Woolworths. He currently leads the Absa

From left: Ahmed Ismael, Duduzile Mkhwanazi (Winner Social Responsibility/Community Award) and Moira de Roche (IITPSA).

From left: Professor Barry Dwolatzky (Emeritus Professor at WITS), Benji Coetzee (2018 Technology Excellence Winner) and Adrian Schofield (Vice chairman, IFIP IP3).

retail digital transformation journey and has been instrumental in the step change experienced across all digital channels in the past three years, including the world first Chatbanking on WhatsApp.

Barkhuizen also hailed the team behind him, noting on the sidelines of the event: *"As a CIO we can all have ideas, but without the team, they stay just that – ideas."*

IITPSA also presented its lifetime award for Distinguished Service in ICT to Dr Jackie Phahlamohlaka, renowned academic, Competency Area Manager at the CSIR and former Chair of Technical Committee 9 (TC9) of the International Federation for Information Processing (IFIP). His work on the use of ICT in peace and war continues to draw much academic interest in South Africa and internationally.

The new Technology Excellence Award, presented to a person or team who has made exceptional or innovative use of technology for an organization, went to Benji Coetzee, founder of EmptyTrips. A Forbes 2018 top female-led technologist, Coetzee launched EmptyTrips in 2017, using AI, network strategies and shared economy principles to pair cargo with empty spaces, democratise freight transport across road, rail, air and sea, and to improve profits and contribute to saving the planet.

The new Social Responsibility/Community Award, for a person, team or project that delivers the benefits of IT on a not-for-profit basis into the community or brings the community into the IT space, was awarded to Project Isizwe, headed by Dudu Mkhwanazi. Project Isizwe is a non-profit that partners with public and private sector organisations to deploy free Wi-Fi hotspots in low-income communities.

"The winners, and all the finalists for the 2018 IITPSA President's Awards are all unique and inspirational," said IITPSA President Ulandi Exner. *"These are IT's superheroes."* IITPSA CEO Tony Parry echoed the sentiment, saying: *"All of this year's finalists are already top achievers in their respective areas."*

WATTSUP

SAIEE Past Presidents awards 50 year members

Werner's Bistro played host to the annual Past Presidents luncheon recently, where some of the 50-year members received their certificates from Immediate Past President, Jacob Machinjike.

From left (front): WS Calder (Past President -1994), JW Gosling (Past President - 2001), SG Bridgens (CEO, Past President - 1998), J Machinjike (Immediate Past President), PM Erasmus (50-year member), GF Bruce (50-year member).
From left (back): LJ Sawers (50-year member), P Naidoo (Past President - 2016), A Muller (SAIEE), PR Jesson (50-year member), HB Grobler (50-year member), A Hoffmann (Past President - 2015), A Hepburn (50-year member), GP Fleischer (50-year member), A Mthethwa (Past President - 2011), M Cary (Past President - 2012), VJ Crone (Past President - 2006), G Geyer (SAIEE), and RG Coney (Past President - 2002).

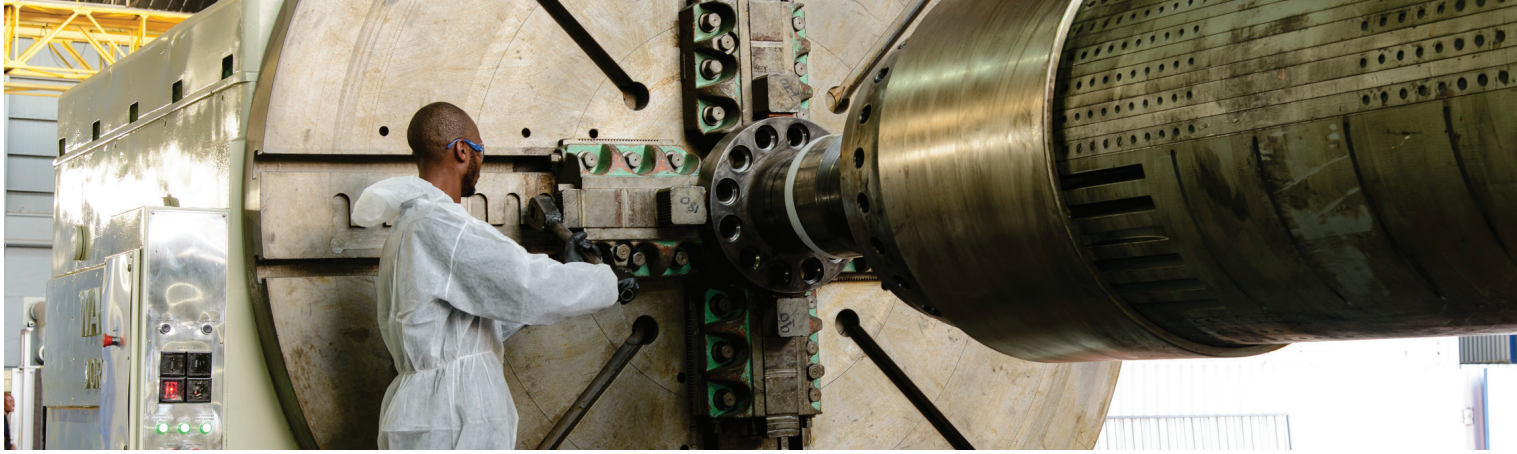
Run 5 essential lighting tests in 30 seconds...

Building maintenance technicians for commercial, retail, or institutional facilities with fluorescent lighting, have hundreds, if not thousands of fluorescent tubes that have to be routinely checked and maintained. Even though those tubes last for tens of thousands of hours, they do ultimately fail, some prematurely, and some stop working because of other problems with the installation ballast. In the past, this type of maintenance has usually meant lots of trial and error. And if a light was found to be out, the technician would have had to climb a ladder, open up the cover, remove the bad tube and replace it. If the new tube didn't light, the technician either tried again or had to call an electrician or bring out a voltage tester.

Fluke has now developed a tool that takes the trial and error - and a significant amount of time - out of maintaining fluorescent lighting. The result is the Fluke 1000FLT Fluorescent Light Tester, specifically designed for building maintenance professionals. It is an all-in-one fluorescent lamp tester, ballast tester, non-contact voltage tester, pin continuity tester, and ballast-type discriminator.

The 1000FLT's user interface was designed to be as simple as possible, with all tests delivering instant results. The ballast, voltage, and pin continuity tests indicate results with either a "Go" or "No Go" indicator lights. The ballast-type discriminator lights up either the "magnetic" or "electronic" LED on the face of the tester, while the lamp test result is determined by the user if the tube lights up or not.

For more information contact Comtest on 010 595 1821.



Massive recision lathe boosts in-house capacity at Marthinusen & Coutts

One of the largest lathes on the African continent has been installed at Marthinusen & Coutts' power generation equipment repair facility in Benoni.

In operation since its commissioning in August this year, the lathe can machine rotors and other components of large electrical and mechanical rotating equipment. With a 3,2 metre swing, it has the capacity to handle workpieces with a mass of up to 40 tonnes and 10 metres in length.

According to Craig Megannon, Works Executive at Marthinusen & Coutts, its business unit ACTOM Turbo Machines was acquired approximately four years ago allowing the division to offer customers a full electro-mechanical solution for all rotating equipment.

"The lathe is a further investment to grow our capacity and services offered to customers. It was purchased in Europe last year and underwent a substantial rebuild and modernisation to enable automated operation," he explains

"This included having it modified to achieve the fine tolerances normally required for the machining of precision power generation equipment," Megannon continues.

"We also upgraded it from semi-automatic operation to a high-precision, numerically-controlled machine."

Barwise joins new firm

Lightning Protection Concepts (LPC), local provider of a full range of lightning protection services, has further strengthened its foothold within the industry, with the recent addition of the current chairman of the Earthing and Lightning Protection Association (ELPA), Alexis Barwise, into the team as a Director and co-owner. Barwise joins founder and fellow co-owner Trevor Manas in a move that could be described as a meeting of like minds.

The new business arrangement brings together two titans of the South African lightning protection industry, each with their unique strengths to add into the holistic mix. Together, Manas and Barwise, through their combined experience and expertise, now offer the market a uniquely comprehensive range of services, covering the spectrum of surge and Lightning Protection Systems (LPS), from external lightning protection through to earthing, Surge Protection Devices (SPD), and Electromagnetic Capability (EMC), to name but few.

Manas, who has over the past 20 years been the Chief Lightning Protection Designer for over 5,000 projects worldwide, authored more than 20 white papers on various aspects of earthing and lightning and is a member of the SABS TC 067/ SC06 lightning protection working group, established LPC in 2017. He set out create a company that offers all of the planning, design, training, and certification required to successfully implement a lightning protection solution that is fully compliant with both local and international standards.

Barwise explains, *"As a consultancy firm, LPC is headed up by true ceraunophiles – those who deeply love but also respect thunder and lightning – and together Trevor and I boast upwards of a combined 35 years of experience in the earthing and lightning protection industry. Having known each other for many years, we have previously worked together in two non-profit organisations, the first being the Earthing and Lightning Protection Association (ELPA), and the second being the Lightning 30 Foundation. We are board members of both organisations and I am the current ELPA chairman, while Trevor is the former ELPA National Director."*

"The Lightning 30 Foundation was established to protect lives. It focuses on reducing the number of deaths and injuries caused by lightning strikes by raising funds to educate people in Africa, including South Africa, on the risks of lightning, and teaching them to be safe. Upskilling school children and wider communities here is particularly important to us. ELPA was officially formed in June 2017 to regulate the local earthing and lightning protection

From left: Alexis Barwise and Trevor Manas

industry, and bring wider awareness and understanding within the industry of the critical need to protect property and lives from the dangers of lightning."

As the former National Director of ELPA, Manas held this position from inception in June last year until April 2018.

He adds, *"Our firm specialises in the design, consultancy, certification, and training of earthing and lightning protection systems. The formalising of our new business arrangement is a logical extension of our individual strengths and experience. LPC is on the cusp of launching several new service concepts and we are looking forward to the next stage of the journey."*

Barwise's background within the sector encompasses tenure with DEHN Africa as managing director, as well as holding the positions of area director for the Americas, Middle East and Africa regions at DEHN & SOHNE+Co, and electrical engineer at Schneider Electric. In addition, he currently serves on various national and international standard and technical committees such as SANS 10142 and SANS 10313 (of which he is current chairman) as well as IEC TC81, and is the current board chairman for ELPA.

"Trevor and I are both members of the International Electrotechnical Commission (IEC), the international standards and conformity assessment body for all fields of electrotechnology, and I will be representing South Africa in November this year at the IEC meeting in China, to present the African voice," clarifies Barwise. *"The combination of my skills and experience with that of Trevor brings together exceptional expertise in lightning and surge protection as well as earth-termination system solutions."*

"This collaboration provides local organisations with unsurpassed, highly comprehensive yet advanced solutions and services, using innovative, compliant design principles in order to attain our top priority, which is to protect people from lightning. We look forward to introducing the market to our extended service offering in the near future," he concludes. wn

OBITUARY - PROF HC FERREIRA

HENDRIK C FERREIRA
1954 - 2018

It is with great sadness that we inform the SAIEE community about the passing away of Professor Hendrik C. Ferreira.

BY | MINX AVRABOS

Professor Hendrik Ferreira was born and educated in South Africa. He graduated with a Doctorate in Science (Engineering) degree from the University of Pretoria in 1980. During 1983, he joined the then Rand Afrikaans University (RAU) as a Senior Lecturer. In 1985 he was promoted to Associate Professor and in 1989 to Professor. He also served two terms as Chairman of the Department of Electrical and Electronic Engineering at RAU, from 1994 to 1999.

Since 1984, he was a visiting researcher at seven universities and two companies in both the USA and Europe. Professor Ferreira was the founder of the UJ Center for Telecommunications. A distinguished scholar and a proud UJ ambassador, he received the Presidential Award of the Foundation for Research Development (FRD) in 1989 which he held until 1993; and was a National Research Foundation (NRF) A-Rated Researcher.

During subsequent re-evaluations by the FRD and its successor the NRF, he was consistently placed in the category reserved for *"Researchers who enjoy considerable international recognition as independent researchers for the high quality and impact of their recent research outputs."*

Since 1989 he was the chairman of the Telecommunications Research Group and was the principal adviser for close to forty post-graduate students working in some aspect of Information Theory or Communications. Fifteen of these students have so far obtained their Doctorate in Engineering degrees.

All of his Masters' students elected to do the full research degree with a substantial thesis, and six have received the RAU or UJ Chancellor's medal for best thesis in their year of graduation. Together with his students, he has published more than 200 research papers in journals and conference proceedings, including more than forty papers in the Transactions of the IEEE (USA).

He organised and served as chairperson of several conferences, including the international 1999 IEEE Information Theory Workshop which was held in the Kruger National Park, the 2010 IEEE African Winter School in Information Theory and Communications, and the 17th IEEE International Symposium on Power-Line Communications and its Applications (ISPLC 2013), that was held in Johannesburg.

His research interests were in Digital Communications and Information Theory, especially Coding Techniques. His research career was built around the societies and the publications of the Institute of Electrical and Electronic Engineers (IEEE) in the USA.

Prof. Ferreira became an SAIEE member in 1984 and transferred to a Fellow in 2010.

Between 1997 and 2005, he served as Editor-in-Chief of the Transactions of the South African Institute of Electrical Engineers. He was also the founding chairman of the Information Theory Chapter of the IEEE (South Africa Section), and a past chairperson of the Communications and Signal Processing Chapter.

To the family, friends and colleagues of Prof Ferreira, the SAIEE extend our sincerest condolences. wn

Stay on top of it with PowerTag

Give your customers greater efficiency with PowerTag wireless energy sensors

With PowerTag™, you can add innovation to any project, easily. Tagging your circuit breakers means greater efficiency for your customers as well as regulatory compliance.

As a connected product, PowerTag is a key part of EcoStruxure™ Power – Schneider's IoT-enabled, open, and interoperable architecture. And a small-but-impressive solution your customers will appreciate.

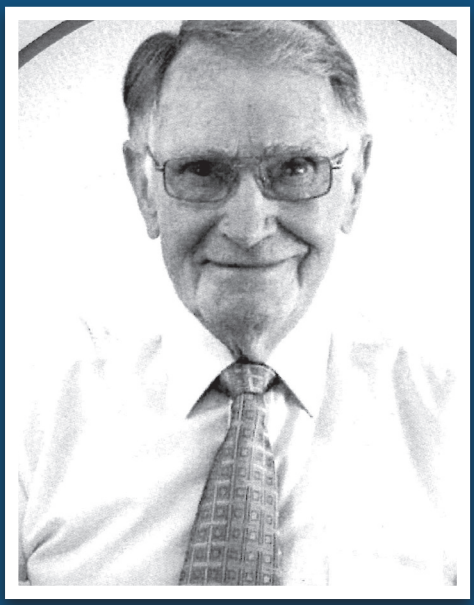
Monitor it. Secure it.* Tag it.

www.schneider-electric.co.za

* Secure it: As part of the Acti 9 communication system, PowerTag monitors loads and identifies load imbalances and overload levels before a trip occurs. PowerTag also alerts you to voltage losses, so you save time recovering your installation in the event of load downtime. An email alert means you can take preventive action thus avoiding potential downtime.

Life Is On | Schneider Electric

OBITUARY - WILLIAM IRIVINE GRAHAM



WILLIAM I GRAHAM
1935 - 2018

It is with great sadness that we share with you, the news of the passing of one of our industry's stalwarts, Bill Graham, after a long illness.

BY I MINX AVRABOS

Born in 1935 in Springs, Gauteng William Irvine Graham attended Springs West Primary School and Springs High School.

From 1952 - 1957 Bill completed his apprenticeship as an electrician on the East Geduld Gold Mine in Springs and studied at night school up to his NTC 111.

During his time at East Geduld Gold Mine, he served two years as the Mine Electrical Energy Controller.

He joined the CSIR in Pretoria in 1961 as a Senior Construction and Maintenance Technician and was based the NASA-operated Hartebeeshoek Deep Space Instrumentation Facility.

In 1967 he joined GEC (which became Klockner Moeller South Africa) at their first South African operation in Cape Town. During this time, he completed a Bachelor's Degree in Commerce with majors in economics and business economics at UNISA.

In 1990 he joined CHI Control as Technical Director where he was responsible for low voltage equipment.

His major accomplishment during this period was the design, testing, manufacturing, installation, site testing, commissioning and hand-over of the twelve substation low voltage switchgear and control gear assemblies for the Mossgas Project in 1995.

In 1993, Bill became a Senior Member of the SAIEE and transferred as a Fellow in 2017.

Bill retired in 2000 but was contracted to CHI Control to oversee the integration of the ISO 9001 Quality Management system at Meissner after the NEI takeover.

In 2001 Bill formed Graham, Golding & Associates Consulting, that specialised in low-voltage switchgear and control gear assemblies design, verification and testing.

He served on numerous technical committees and workgroups of the South African Bureau of Standards (SABS) for many years and was the current convenor of the SANS 1973 workgroup and a member of the IEC mirror committees.

Bill was the driving force behind the continuation of the Assembly Assessors Course, which was initiated by the SABS many years ago. This was an excellent initiative that established an enhanced level of knowledge around the application of relevant SANS and International Electrotechnical Commission (IEC) standards. He also worked very closely with the technical committee of the Electrical Switchgear Association of South Africa (ESASA) to produce its low-voltage switchgear design guide.

Much of Bill's work was done out of his love and passion for the industry, and his desire to empower people. He donated much time and advice without compensation and will leave a legacy of loyalty and commitment to local manufacturers.

The SAIEE expresses our condolences to his family and partner, Sue Golding. wn

Since 2006, we have been involved as consulting electrical engineers across a broad spectrum of projects. These include housing estate reticulation, office buildings, warehousing, shopping centres, automobile dealerships, training facilities, and emergency generating systems, to name a few.

DEDICATED TO DESIGNING YOU A SAFER GREENER ENERGY EFFICIENT FUTURE

With a combined 60 years experience, we have developed a niche in various key projects in the electrical and construction industry. We are dedicated to provide the technical skill and service you deserve.

T 011 679 3481 **F** 086 537 3589 **E** wayne@bergmanfisher.co.za

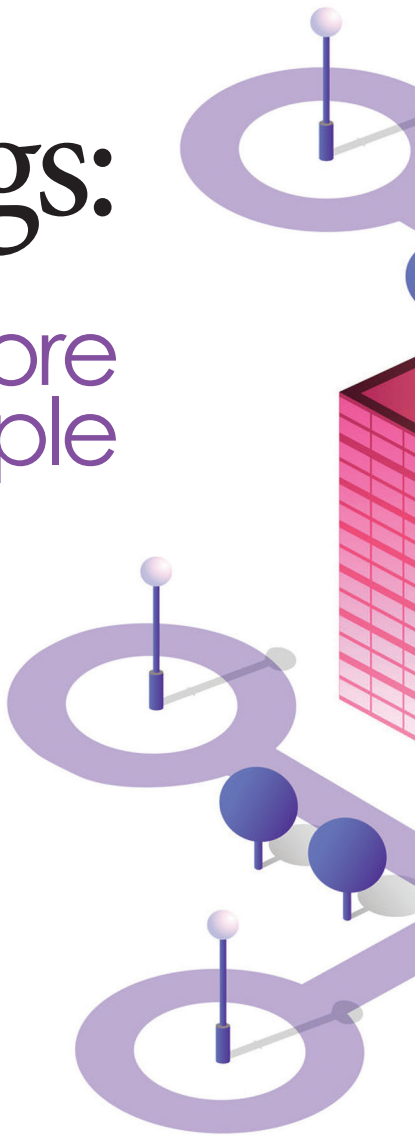
www.bergmanfisher.com

BERGMAN FISHER ASSOCIATES (BFA)
CONSULTING ELECTRICAL ENGINEERS

Earn CPD Credits

Intelligent buildings:

For smarter, healthier, more productive people



By 2050, the U.N. expects two-thirds of the world's population to live in cities and the need for real-time data that helps new urban populations thrive will grow exponentially. Half the opportunities for Internet of Things (IoT) vendors are expected to come from the built environment— homes, buildings, factories and cities, according to McKinsey.[1]

BY | ANIRUDDHA DEODHAR

WHY BUILDINGS MATTER IN THE ERA OF THE INTERNET OF THINGS

Experts expect more than a trillion devices to be connected to the internet by 2035 with many providing data insights that help the governance of the world's major population centres.

Half the opportunities for Internet of Things (IoT) vendors are expected to come from the built environment—homes, buildings, factories and cities, according to research firm McKinsey.[1]

BUILDINGS, OUR WORKPLACE & OUR HOME

Buildings are where people live, work, learn, meet, heal, entertain and shop. Americans spend 90 per cent of their time indoors[2], and companies that employ them spend 90 per cent of their building's total operating costs on people-related expenses.[3]

More than 50 per cent of the world's seven billion people already live in cities, according to U.N. statistics. By 2050 close to two-thirds of us will

be urban dwellers. To support this rapid urbanisation, buildings must become smarter and more sustainable than ever before.

BUILDINGS, OUR WEAPONS AGAINST CLIMATE CHANGE

Any conversation about mitigating climate change must start with buildings.

In the U.S., buildings contribute to nearly 40 per cent of energy use and carbon emissions, and more than 60 per cent of non-industrial waste and electricity consumption.[4]

Apart from reducing carbon emissions and energy-related operating expenditures, green buildings have also been found to reduce absenteeism and tardiness, increase 'presentism,' and potentially lead to better talent retention and attraction.

BUILDINGS, GROWTH ENGINES OF OUR ECONOMY:

Buildings are responsible for a substantial portion of a country's GDP.

In the U.S., commercial real-estate development, construction and ongoing operations contribute hundreds of billions of dollars to GDP each year. Smart buildings have been found to increase lease rates, improve occupancy rates and net operating

Intelligent Buildings

continues from page 31

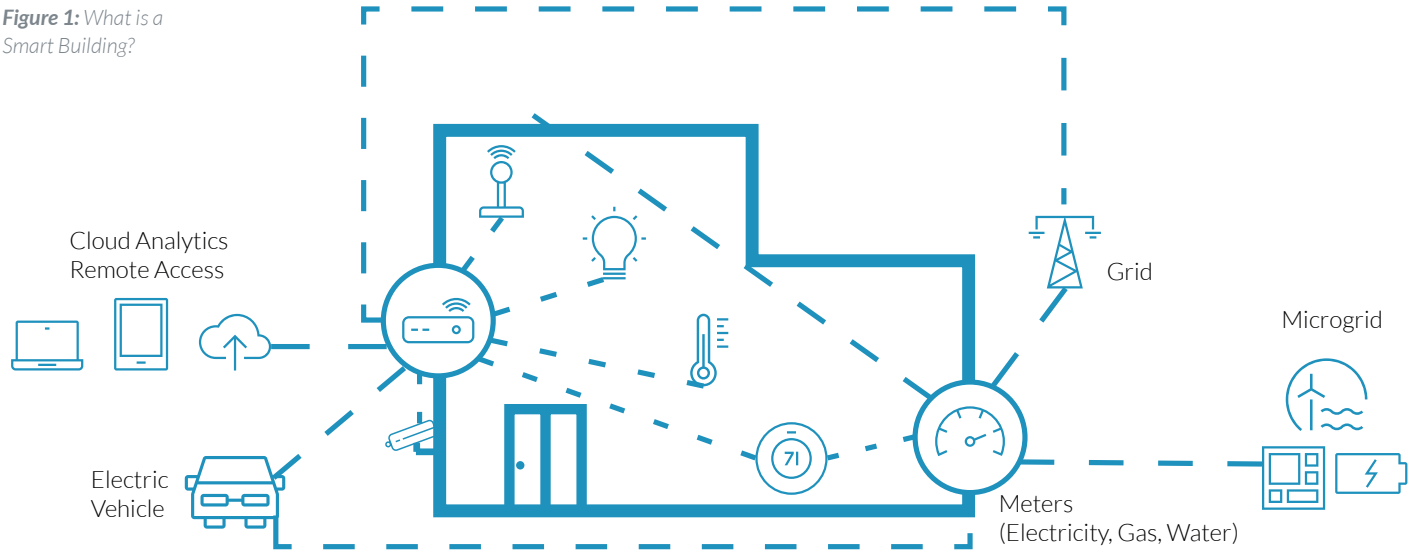


Figure 1: *What is a Smart Building?*

incomes, and lower capitalisation rates—all leading to higher resale values.

CALCULATING BUILDING COSTS

Commercial real-estate investment firm Jones Lang LaSalle has determined a 3-30-300 rule which states that for every $3 per square foot organisations spend on energy, they spend $30 on rent and $300 on their employees' salaries and benefits.[5]

Addressing the needs of building occupants is the highest priority for smart building technologies. A recent study by Harvard's T.H. Chan School of Public Health and United Technologies found that cognitive functions improved with better indoor environmental quality and ventilation.[6]

A follow-up study found positive impacts on sleep and wellness. [7]

However, complex relationships between tenants, landlords, utility suppliers and service providers, who grapple with misaligned incentives, security concerns and complex technologies that deliver poor returns on investment, are hindering the adoption of smart technology in buildings. Technology vendors must provide solutions that are low cost, low maintenance, easy to use and highly secure, to inspire the trust and confidence of all the decision makers in this value chain.

This white paper shows how IoT technologies companies can address the challenges of today's enhance the health, comfort, wellbeing and security of occupants, and boost profits through productivity and efficiency gains.

HOW "BUILDING" IOT CAN IMPROVE LIVES

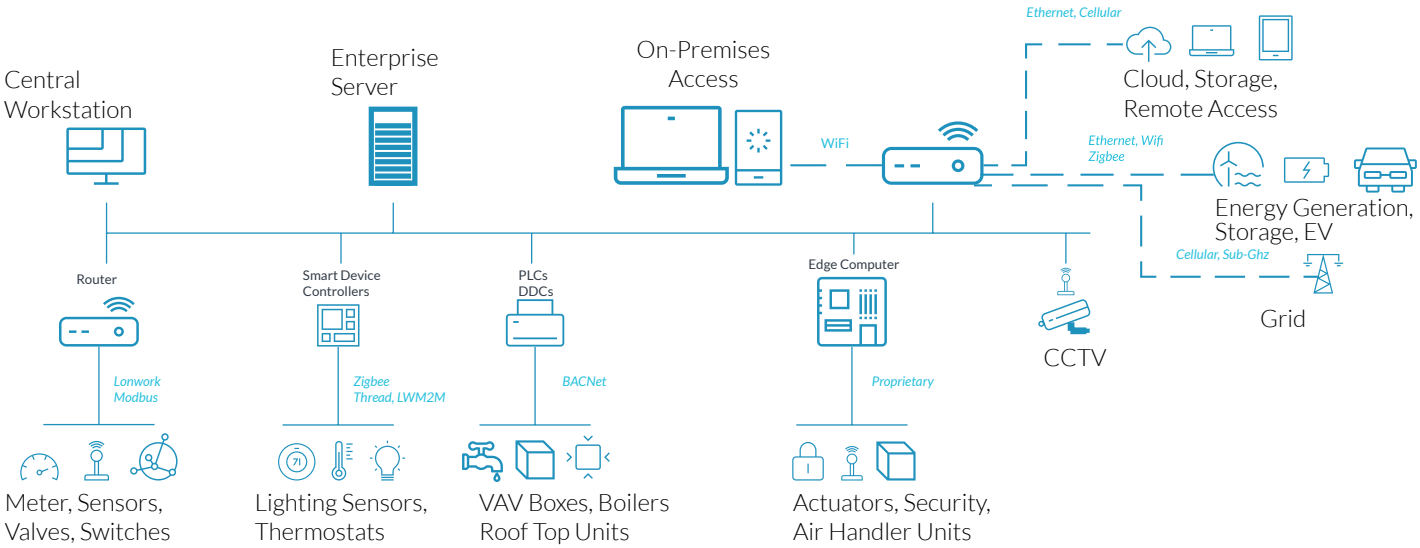
Modern buildings are increasingly connected, so operational systems are enhanced by data insights that make the structure more resistant to internal and external challenges. A few years ago, the only interaction between a building and its broader environment came via utility meters.

The highest-performing buildings may be receiving a host of data from environmental control systems such as lighting arrays, temperature, humidity and air quality sensors. They may also be dealing with structured and unstructured information from the cloud, and on-premises systems governing areas such as security, elevator banks and the HVAC network.

The building control system should be capable of combining that data with external information that may also affect the building's operation. That might include national and regional energy grid spikes, the state of local micro-grids (used for energy storage and renewable generation) and demands driven by the building's occupants such as electric car charging.

Given the 3-30-300 rule as mentioned earlier and business imperatives to attract and retain top-notch talent and increase the value of the buildings, building owners and operators have moved beyond just making buildings energy efficient, to advanced applications for which lighting is fast becoming the backbone.

Figure 2: Building IoT architecture



SPACE OPTIMISATION: Understanding space usage patterns and rates, such as the occupation of conference rooms and whether employees have sufficient workspace, can help create more creative, collaborative spaces that foster innovation while preserving productivity. Space optimisation also has the obvious benefit of reducing operational expenditures.

INDOOR LOCATION AND MAPPING: Knowing where people are in an emergency, or what meetings and events they're attending can help improve security and space usage. Other benefits include the ability to connect people at significant events, and assisting people to find their ways in unfamiliar surroundings, such as airports, campuses, and hospitals.

ASSET TRACKING: Mobile assets such as ventilators, infusion pumps and telemetry units account for 95 per cent of a hospital's clinical asset inventory, yet have less than 50 per cent utilisation rates due to them being lost, stolen or misplaced. The result is a less efficient, more costly hospital operation.

BUILDING AUTOMATION: Intelligent lighting can not only reduce lighting-related electricity consumption, but there are also even more benefits in using occupancy, light, temperature sensors to control the climate through communication with the HVAC system. Further, these sensors can be used to automate security and access control, as well as the personalisation of the workspace.

The process of implementing "Building IoT" starts with deciding upon the right sensors. Sensors that are low power or energy harvesting, miniature, secure and versatile lead to lower capital expenses, decreased maintenance costs and easier deployments.

Data from these devices are translated and transmitted through routers, gateways, nodes, and edge computers via a myriad of proprietary and open protocols. Gateways translate and bridge protocols, and enable on-premises control of the building through central workstations and mobile devices.

A lot of computing happens at the edge due to a need for lower latency in decision making, business continuity during sporadic connectivity, higher distributed computing and increasingly stringent privacy and security concerns. These appliances connect the building to the cloud through cellular or Ethernet connectivity. The cloud enables remote access, higher level analytics and communication with the grid and micro-grid.

Lastly, critical to a successful smart building deployment is a single IoT data and device management platform that is secure, agnostic to the type of device, connectivity and cloud, and provides interoperability, ease of development, deployment and use.

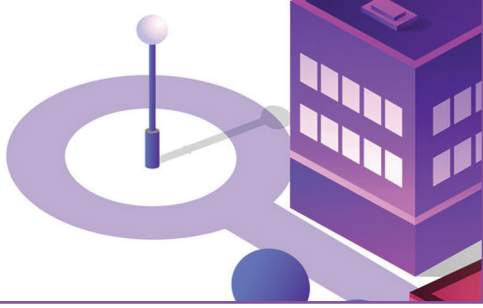
IMPORTANT CONSIDERATIONS FOR SUCCESS

Building owners and operators cite three challenges to embracing smart building technologies.

SECURITY: owners have deep-rooted concerns about security IoT security can

Intelligent Buildings

continues from page 33



be a critical threat not only to individual devices and services but also to the national infrastructure. In one well-documented attack, IP surveillance cameras three were aggregated into botnets and used against significant websites. Separately, security researchers have shown vulnerabilities in vehicles, and even smart light bulbs.

End-to-end IoT security is non-negotiable. It must be baked into solutions from the start for a thriving market of connected products and the stability of the internet itself.

COST: Investors require quick paybacks Stakeholders are opposed to implementing projects with a Return on Investment (ROI) of less than two years, partly due to their investment horizons and the availability of capital. Facility managers often tack technology upgrades onto other budgeted retrofits to reduce costs and boost returns. Startups often look to customers from municipalities, universities, schools, and hospitals as an attractive entry point due to their long-term capital, long horizons, and aggressive climate action plans, but find that sales cycles can be notoriously long.

Still, the price point of IoT technologies has been plunging in recent years, which coupled with innovative financing models, promises to deliver a healthier ROI.

INTEROPERABILITY: facility managers want solutions to work right out of the box. Building owners despise the complexity of many IoT technologies. Stakeholders, especially those involved with small and medium buildings, do not have the budget or the bandwidth to employ consultants and maintain sophisticated equipment through onsite specialists.

The plethora of protocols and the requirement for any new technology to interoperate with all legacy protocols and equipment, often make IoT implementation a complex task. Consequently, the building industry is overwhelmingly choosing technology that works straight out of the box, just as consumers want smartphones and home routers.

LAYERED SECURITY IMPROVES TRUST AND CONFIDENCE

Threat-specific protection is a non-negotiable element in IoT system design. It must address all relevant threats to communication, device lifecycle, software and the physical chip. Experts are making security for IoT products easier by developing technologies built from the ground up with safety in mind, such as enabling the partitioning of sensitive keys and data and making devices uniquely identifiable. It allows designers to focus on the differentiation that will make their product sell, rather than dealing with the fundamentals of trust.

Platform Security Architecture (PSA) provides a set of foundational principles and necessary resources (including APIs, architecture specifications and firmware) to help achieve appropriate security across connected devices.

An essential part of PSA is ensuring that designers follow the exact threat modelling process to determine the threats to their connected device and that they can pick the appropriate security technologies. Companies developing products for intelligent buildings can use the PSA guidance and threat model examples for their equipment. Designers can choose the proper security technologies, once threats are identified. Experts recommend implementing security in multiple layers.

CONCLUSION

There are clear environmental, economic and financial benefits to making buildings more sustainable and more comfortable. Smart buildings help improve lives by keeping people healthier, safer and more productive.

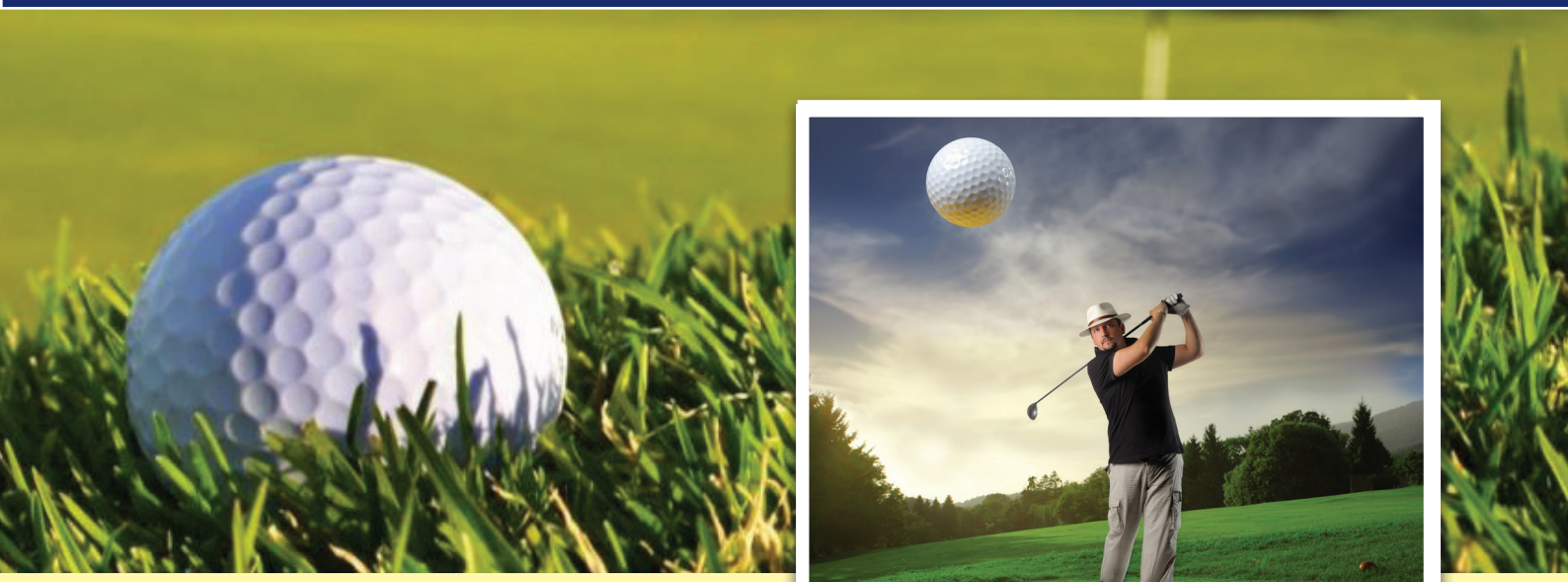
IoT technologies that build trust and confidence through low cost of ownership and layered security on a pre-integrated IoT platform with support for standard protocols help accelerate the market penetration of smart building solutions. wn

REFERENCES

1 *Unlocking the potential of the Internet of Things*, McKinsey and Company, June 2015.
2 *The Inside Story: A Guide to Indoor Air Quality, US Environmental Protection Agency.* Retrieved from https://www.epa.gov/ indoor-air-quality-iaq/inside-story-guide- indoor-air-quality.
3 *The Impact of Ventilation on Productivity, Center for Built Environment*, University of Berkeley, July 2007. Retrieved from http://www.cbe.berkeley. edu/research/briefs-ventilation.htm on 11/14/2016
4 *Annual Energy Outlook 2018, US Energy Information Administration.* February 2018, https://www.eia.gov
5 *"The 3-30-300 calculator,"* Jones Lange LaSalle. 2014, http://www.us.jll.com/united-states/ en-us/services/
6 *Stale Office Air is Making You Less Productive,* HBR, March 21, 2017,
7 *The Impact of Green Buildings on Cognitive Function, United Technologies* Retrieved from http://naturalleader.com/ thecogfxstudy/ on 11/14/2016.

ANNUAL CHARITY GOLF DAY

IN SUPPORT OF YA BANA VILLAGE FOR CHILDREN



Ya Bana means "for the children." The Village is an ambitious project aimed at providing vulnerable and orphaned children with permanent housing in a family environment where trained house mothers offer love and structure. The Village believes that in order for children to become balanced and productive citizens of society, they need holistic care. The programs focus on the physical, emotional, educational, spiritual and cultural needs of the child.

Ya Bana Village was founded in 2006 when 8 hectares of property was bought by the Mabopane Foundation USA.

The property was registered and rezoned for the development of a Village for Children. Currently, the organisation is registered as a non-profit organisation, and as a Child and Youth care centre.

The village is surrounded by a community which still finds it difficult to cast off the shackles of poverty.

PRETORIA COUNTRY CLUB

2019

8 MAY

BOOK NOW

R3 500 per 4-ball (excl. cart)
Free t-shirt & cap
Format: Better Ball, Stableford.

Sharon Stobbia
M 083 283 2226
E stobbia@intekom.co.za

Sponsorship Packages available from R5000

www.saiee.org.za

It feels like just the other day when my village finally got access to electricity. Before then we had to make sure we have enough candles and matches to last us the evening. My family was considered to be a bit advanced because we had a prima stove (Paraffin Stove) and didn't need to go fetch the wood from the mountain to cook on an open flame as was the case with most of the villagers.

BY | ITANI PHAFULA **|** SENIOR ENGINEERING TECHNOLOGIST

Standardisation of Solar PV Equipment

A SADC Perspective

Today it is easy to neglect the importance of coming home after work and pressing a button on the wall for lights to go on, or to stand in front of a stove and turn a few knobs so that we can cook. It is easy to overlook all the privileges that having access to electricity gives us - access to information through the television, the internet and telephone services. There are secondary privileges too such as the ability to reach medical services quickly.

But as we enjoy these privileges, we tend to think that it is everyone that enjoys it. It is inconceivable that somewhere out there young boys and girls still need to fetch wood for cooking. Their school final exam preparations are suddenly interrupted when all the candles they have been using to study burned out. The only access to exam study material are the notes that they copied during class from their teacher as they don't have textbooks or access to the internet where they can get a more in-depth understanding of the subject.

PROBLEM STATEMENT

According to a Southern Africa Developing Countries (SADC) Energy Overview Report 2016, the SADC region is home to some 294 million people, of which only 44 per cent have access to electricity. This means that 164 million people do not yet have access to power or any of its privileges. This is an energy crisis, and we cannot continue to do things the way we have always done them in the past if we are to have any chance of reversing this situation.

Many reasons exist as to why so many people in Southern Africa still do not have access to electricity. These include the following: -

Insufficient capacity to supply everyone should be available. This is because the service providers are currently struggling to keep the lights on for the current customer base. The investments required to meet the demand run into hundreds of billions of dollars — financial resources that are not available to SADC governments.

A backbone system consisting of transmission and distribution lines must be in place to transport energy from the source to the people. The construction of such a system would also cost a lot of money and take a very

Standardisation of Solar PV Equipments

continues from page 37

long time to complete as Southern Africa is a geographically vast land.

The financial return on investments for such project may not make sense as a majority of the affected people live below the poverty line and would not be able to afford electricity rates.

Africa has access to many energy sources; these include wind, hydro, gas, petroleum, geothermal, uranium deposits used as fuel for nuclear, biomass which is currently the most popular in electricity generation in the region and solar. Solar is proving to be a more popular source of renewable energy in the SADC region.

In South Africa, many metropolitan municipalities are exploring the possibility of incentivising their residents and businesses for in-feeding energy derived from solar equipment (not sure if that is better) into their network. This means that regular households can now become micro-grids connected to the national grid. With the declining cost of solar PV and storage batteries, solar micro-grids are an ideal solution to the electrification challenges in the region.

PROPOSED SOLUTION

The most commonly asked questions is how big the solar PV and battery need to be for them to energise a household. But perhaps before we answer this question, we need to start by redefining what electrification means to a person living in a remote rural area.

Most people living in these areas require the most basic form of electricity: they need to have lights when it gets dark and be able to charge their cellphones. Radios and televisions are also essential for them to get information and entertainment. This definition of electrification means that electricity can be made available to people living in remote rural areas using solar PVs and batteries at a fraction of the cost.

THREE MODELS CAN BE CONSIDERED TO ACHIEVE THIS

A centralised approach where a micro-grid is established in a community - the solar PV plant and storage batteries are located in a communal and centralised area. This approach requires some reticulation infrastructure to be developed to transport electricity from the central point of generation to the homes of the community.

The advantage of such a system is that maintenance is fundamental to communities and future integration can have them share the costs into the national grid. It will also be easier to add other generation sources to the grid. The disadvantage is that the initial cost of setting a reticulation network maybe high, especially in areas where houses are geographically far from each other.

A decentralised approach where the installation is located locally – the solar PV is on the rooftop of each home, and the batteries are in the house. The individual customer bears the installation and maintenance cost of such a system. The benefit of such a system is that the set-up cost is lower as there is no need for a reticulation system. The disadvantage is that future grid integration is not easy.

Hybrid where a centralised PV and battery installation exist, but local facilities also support it – In this form of installation, customers may choose to install more capacity for their homes by installing roof-top PV, storage batteries. Customers with excess capacity can sell it to their neighbours and businesses in their area. The advantages of such an installation is that future integration into the national grid is easier, and the customer becomes an entrepreneur. The disadvantage is that such a setup might be pricey.

BENEFITS OF STANDARDISATION

As it stands many questions regarding the type of PVs and how they should be installed remain unanswered. Standardisation bodies need to prioritise the standardisation of solar PV installation for micro-grid. Technical experts from the affected areas should drive the standardisation process as they will have an in-depth understanding of the customer requirements.

REDUCED PRODUCTION COST – standardising the type of solar PV equipment and their configuration will assist manufacturers of this equipment to reduce development costs. This will, in turn, reduce the value of the units to the end customer.

MARKET COMPETITIVENESS – standardised equipment would mean that customers are not locked up to a single supplier that produces proprietary material. Suppliers are also able to compete with each other on price for the same product.

EASE OF INSTALLATION – Installers will be able to install the same product from different suppliers.

There are other benefits such as the ambiguity of tests required is removed, and safety concerns can also be addressed during standardisation.

BENEFITS TO SOUTH AFRICA

A mass solar PV installation in the SADC region will require a considerable amount of PV equipment. South Africa already has the production capacity, and this capacity will increase. The increase will thus create jobs in the local manufacturing industry.

As South African manufacturers become involved in research and development for the standardisation project, they will gain knowledge and intellectual capital in the field. This will lead to a new understanding. South Africa will also be able to influence international standards in this field.

In the long term, South Africa will benefit from more young people who have access to information because they now have access to electricity. These young people will grow up to become responsible citizens in society.

CONCLUSION

The Southern African Developing Community has a long way to go before it realises its vision of electrifying every household in its region. To achieve this, it will need to make non-conventional choices.

A few potential energy generation technologies exist in the region, but solar PV technology can be implemented faster, and in most instances, cheaper. This is due to the abundant availability of sunshine in the area.

There are various ways to configure Solar PV installations. The preferred configuration requires for the installation to be done centrally with a small reticulation network transporting the electricity to the household. The household should be given an option also to install their own rooftop PV and sell the power back to the local grid.

Mr Itani Phafula

Standardisation of Solar PV equipment and installation will reduce the cost of deployment and maintenance.

South African PV equipment manufacturers will benefit from a mass installation on solar PV micro-grids.

The technology required to impact the lives of many Africans exists, it is time to implement it. wn

EDITOR'S NOTE

In July 2018 the South African Bureau of Standards (SABS) ran an essay competition for the IEC Young Professionals Programme where candidates were required to write an essay about: Worldwide, electro technology is developing at a faster and faster pace. Africa is uniquely placed to take advantage of global technology developments, and 'leapfrog' other continents in their application. Which developing technologies do you consider should be prioritised for standardisation, and what benefits could be gained? What specifically could be the benefits for South Africa?

There were two winners of this competition, namely: Mr Itani Phafula & Ms Mantie Hlakudi - ED.

Earn CPD Credits

The fourth industrial revolution presents a window of opportunity for South Africa to embrace global technology developments and leapfrog other countries in their application. This article proposes developing technologies that can be prioritised by the state, particularly the Energy Sector. The challenges and opportunities that face the Energy sector today, require collaborations and unrelenting drive by key stakeholders.

EXISTING SOUTH AFRICAN LANDSCAPE

Eskom, a South African utility company that generates, transmits and distributes approximately 95% of South Africa's electricity and supplies 45% of the continent's electricity. The generation technologies breakdown is as follows (44 134 MW (100%)):

- Coal-fired Power Stations 36 441 MW (82.6 %)
- Nuclear Power Station 1 860 MW (4.2%), and
- Hydro stations 600 MW (1.35%),
- Pumped Storage stations 2 724 MW (6.17 %),
- Wind 100 MW (0.23%).

The majority of the power stations are in the Mpumalanga province. There is a total of 32 220 km of high voltage transmission lines and 344 993 000 km distribution lines. The customer mix is as follows:

- 22.6 % industrial,
- 4.8 % commercial,
- 2.5 % agricultural,
- 14.3 % mining,
- 41.9 % Municipalities,
- 7.1 % International,
- 1.3 % Rail and
- 5.5% Residential.

How South Africa will benefit by Standardisation

BY | MANTSIE HLAKUDI | PR ENG

Interestingly the 5.5% residential comprises of 4.7 million residential customers or households of which the majority of these are poor households located either in the large cities or in the rural areas far from the main metropolitan centres.

Over the last twenty years, the country has continued to aggressively drive the electrification program under the auspices of 'Universal Access'. This aggressive program aims to bring electricity to every household in the country by 2030. The last report by the Department of Energy shows that there is still a backlog of over 10 million homes that will need to be electrified by the set date. Universal Access is a tremendous political necessity, but a terrible financial investment, because the majority of the beneficiaries are unable to pay for it. In the last five years of these twenty years, the cost per connection has been increasing. Two reasons that have been cited are the location of the un-electrified households from power sources as well as the drive for operational efficiencies.

For many years the cost of electricity by Eskom was low due to a vast coal resource. Today, the cost of electricity from new coal and nuclear power are among the most expensive technology per kilowatt-hour (kWh) of electricity delivered. The high tariff is due to full capital costs, fuel costs and all fixed and variable operating and maintenance costs over the lifetime

How SA will benefit by Standardisation

continues from page 41

of power stations. The building of the two new coal-fired power stations, Medupi and Kusile, has resulted in Eskom having to increase electricity tariffs to fund investments.

At the moment the coal resources are slowly being diminished, and the need to reduce greenhouse gas emissions due to growing evidence of climate change necessitates the need for alternative forms of energy to join the mix. The carbon emission by The South African national supplier increased from 208.9 million tons in 2007 to 215.6 million tons in 2016.

On the other hand, South Africa has set a renewable capacity target of 17.8 GW for 2030 (21% of electricity generation from renewable energy), and the challenge that remains is that the coal-fired generation plants will grow with the completion of Medupi & Kusile power stations. The Government recently signed agreements with Independent Power Producers that are expected to add 2300 MW of electricity to the national grid over the next five years. The imminent introduction of the renewable energy mix in South Africa challenges the status quo concerning practices in the electricity supply and distribution industries.

At present, the electricity supply and distribution industries are faced with the challenges of having to do more with less. This means that they should provide affordable electricity amidst investment required to keep up with the growing demand for universal access to energy. To ensure operational efficiency and sustainability, the electricity industries will have to relook its current practices and find long-term efficient solutions that will provide accessible and affordable electricity.

Natural disasters, such as storms and droughts, necessitate efforts to ensure energy security or sustainable energy supply in the midst of emergencies that takes down the national grid system. Development and adoption of microgrids are considered a solution by many countries, and South Africa has to craft policies to facilitate adoption.

South Africa has been subjected to the following natural disasters recently:

- the Western and Eastern Cape are experiencing water shortages (2016 and 2017-2018); this has shown how energy sector power stations are vulnerable as Eskom had to stop using electricity generated from the Gariep Dam due to its low water levels.
- a tornado hit the Vaal Marina in December 2017 which resulted in considerable damage to power lines. There has been no electricity from that region as Eskom has yet to rebuild the power lines.

PROBLEM STATEMENT

The South Africa Energy Sector faces the following challenges:

- the 10 million household backlogs that need to be electrified by a set date;
- the rising of the cost of each connection, with financially struggling electricity suppliers and distributors;
- un-electrified rural areas that are situated remotely and in mountainous and forested regions where the grid extension is a challenge due to high costs required for extended and dispersed distribution and transmission lines;
- in the metropolitan regions, the informal settlements without electricity are a challenge as the construction of the infrastructure and the identification of the customers is onerous.
- the optimistic goal of South Africa to have 21% of generating capacity from renewable energy by 2030 in support of preserving the environment by reducing carbon emissions;
- the increment of carbon emission by national electricity supplier from 2007 (208.9 million tons) to 2018 (215.6 million tons);
- the cost of energy supply (generation, transmission and distribution) is increasing which necessitates electricity tariffs increase to customers (including the subsidised), to fund the investment with an existing culture of non-payment;
- the prevalent natural disasters threatening the grid's reliability (Security); and
- the willingness to pay for electricity is low resulting in low incomes from rural households and informal settlements including some municipalities that are electricity distributors resulting in poor revenue collection that leads financially constrained energy suppliers and distributors.

PROPOSED SOLUTION

In light of the challenges mentioned above, there is a growing call for standardisation of the following technologies:

- Microgrids Technology (On & Off-grid)
  "Microgrid is defined as a small-scale power grid that can operate independently or collaboratively with other small power grids."

- Drone Technology-
  "Drones is defined in a technological context as an unmanned aircraft."

South Africa should take full advantage of microgrid technology, and the benefits are:

- the escalation of universal power access to unelectrified communities and quick deployment with short project timelines;
- energy security or Sustainable energy supply amid emergencies that result in outages of the national grid with some root causes applauded to prevailing natural disasters; and
- reduction of carbon emissions by renewable energy sources.

Microgrid technology can help South Africa to reach the set renewable capacity targets. Microgrid systems can be built next to where the electricity is needed which reduces the transmission and distribution line losses and cost of infrastructure ensuring that less power is required to meet the same level of demand (South African national supplier of electricity sold 214 121 GWh versus the supplied energy output of 220 166 GWh and the accountable losses is 6 045 GWh).

The reduction of maintaining reliable services will be beneficial to financially constrained municipalities and Eskom. In areas where electricity is served with a single radial transmission or distribution line, this technology can provide reliability with an alternative source of supply. South African electricity suppliers and distributors should make use of drone technology, and the benefits are:

- the increased cost of efficiency
  - the implementation of microgrid systems will need more human resources with financially constrained power utilities; and
  - the deployment of drones will assist with the utilisation of skeletal staff and reduce the cost of Line inspection by traditional methods (foot patrol, vehicle and helicopter).
- improved inspection data
  - better detail as the drone is smaller and get closer to the assets being inspected;
- assist in the reduction of the carbon footprint
  - helicopters and vehicle inspections have higher emissions in comparisons to drones;

How SA will benefit by Standardisation

continues from page 43

- increased safety
  - personnel are not required to walk or drive dangerous terrains; and
  - minimal exposure to live lines.
- timing is reduced to conduct inspections, which improves the quality of supply. Potential defects are repaired quickly and improve fault findings (tree contacts and flashed insulators).

Standardisation of the drone and microgrids technologies is envisaged to bring tremendous socio-economic benefits to the South African nation. The lack of uniformity and regulation regarding the operation of the grid is a severe challenge that continues to hinder interest and recognition of microgrids for future energy supply in South Africa.

There is a false perception that they are high-risk investment due to concerns on quality and safety. Due to the microgrids not being standardised, the requirement for specialised engineering for every microgrid project has proven to be costly in design.

Embracing the microgrid technology will enable us to change many lives in our country. In South Africa, there has been very little progress with deploying microgrids system even with the Government's initiated Integrated Plan (IRP) 2010 - 2030 which details the 20-year plan to integrate renewable energy onto the national grid. Around the world, there has been a significant development with well-established microgrids engineering principles.

The IEEE technical standard that plays a vital role in microgrid interconnection standardisation is IEEE Std.1547.4-2011, Guide for Design, Operation and Integration Distributed Resource Island Systems with Electric Power System.

Mantsie Hlakudi

Although the military have widely adopted drone technology, rules and regulations are in their infancy for commercial and private use. Regulations of this nature are required to ensure the safety and privacy of the public.

There is a low-level regulation due to no uniform design standards and regulations in spaces of navigation, control and communication protocols.

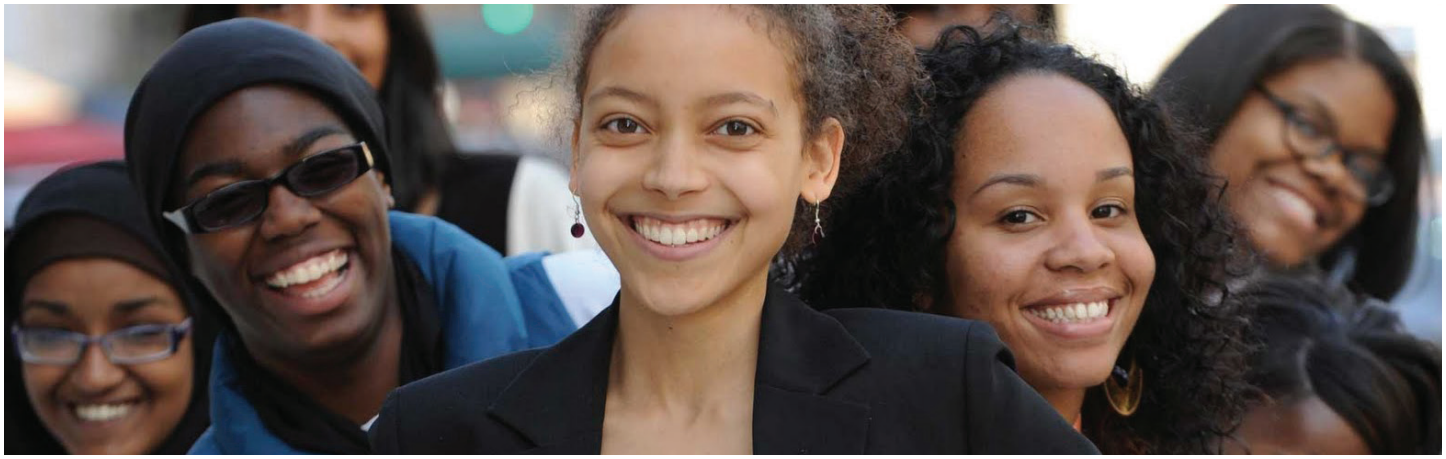
CONCLUSION

The Government should formulate electrification strategies that will assist with positioning microgrids to accelerate the power access to communities.

Furthermore, they should focus to develop supportive regulatory and policy frameworks with all key stakeholders to refine operations and business models that will drive standardisation of this technology. South Africa can drive standardisation of this technology through refined business and ownership models with key role players.

The innovative drone applications may take several years to develop, however, for the country to take full advantage, the Government and key role players must apprehend how the landscape is expanding and begin to refine strategies. wn

HELP UNLOCK OUR FULL POTENTIAL



A job shadowing workplace experience and a post-school alumni programme are the initiatives of a unique public-private partnership, conducted under the banner of TechnoGirl. As a significant contributor to the growth of Science, Technology, Engineering and Maths (STEM) skills in South Africa, we at TechnoGirl are convinced that well-developed STEM skills are vital to our country's future competitiveness in the global economy.

TechnoGirl would like to appeal to corporate South Africa to unlock the latent potential that exists in a primarily marginalised segment of our population – young women at the beginning of their productive lives with potential in STEM.

GET INVOLVED WITH OUR INITIATIVES

JOB SHADOWING

Starting at Grade 9 and continuing until the end of Grade 11, girls are given the opportunity to immerse themselves in actual work environments where
they are then able to observe, engage and generally experience the day-to-day rewards and challenges of specific technical job roles.
Shadowing sessions are scheduled over three consecutive school holidays, annually over the three years.

ALUMNI PROGRAMME

From Grade 12 onwards, girls join the Alumni Programme. This component supports them during their post-school education, access to industry networks and access job opportunities in their chosen field of study.

Contact us today to find out how you can make a difference!

TechnoGirl ZA www.uweso.co.za 011 791 9950

TechnoGirl
Experience.Learn.Grow

Earn CPD Credits

Lightning Sprites and Whistlers

There is much more to lightning that can be seen from Earth. There is complex activity above the clouds reaching up to 100 km in the ionosphere.

BY | DUDLEY BASSON

Sprites are cold plasma electrical discharges above thunderstorm clouds, reaching high into the ionosphere, to an altitude of as much as 90 km. These discharges are more akin to the releases in fluorescent tubes than to those of lightning flashes to earth, or between clouds.

The sprites are usually long vertical reddish-orange flashes with dangling tendrils, which often appear in clusters. They have been reported as far back as 1886 but were only first photographed on 6 July 1989 by scientists of the University of Minnesota using a low light video camera. Many subsequent video recordings have been made.

Observing sprites from the ground can only be done in exceptional conditions, which requires a vantage point with a clear sky and a view of a distant thunderstorm with preferably a dark sky background. Sprites have been extensively photographed and studied from aircraft and the International Space Station. Sprites have been

observed around the globe in areas where thunderstorms occur.

The US Air Force Research Academy has categorised the sprites into three types based on their appearance:

- Jellyfish sprite – huge, up to 48 km by 48 km.
- Column sprite (C-sprite) – large-scale electrical discharges above the earth that are still not entirely understood.
- Carrot sprite – a column sprite with long tendrils.

Optical imaging using a 10 000 frames-per-second high speed camera showed that sprites are actually clusters of small, decametre-sized (10–100 m) balls of ionization that are launched at an altitude of about 80 km and then move downward at speeds of up to ten percent the speed of light, followed a few milliseconds later by a separate set of upward moving balls of ionization.

Sprites may be horizontally displaced by up to 50 km from the location of the underlying lightning strike, with a time delay following the lightning, that is typically a few milliseconds, but on rare occasions may be up to 100 milliseconds. The sprites are usually triggered by positive lightning flashes to the ground but can also be triggered by negative return strokes. The sprites typically last longer than the lightning strikes that trigger them, which only continue for a few milliseconds.

Sprites are sometimes preceded by a sprite halo, a pancake-shaped region of weak, transient optical emissions of about 50 km across and 10 km thick, lasting about one

Lightning Sprites

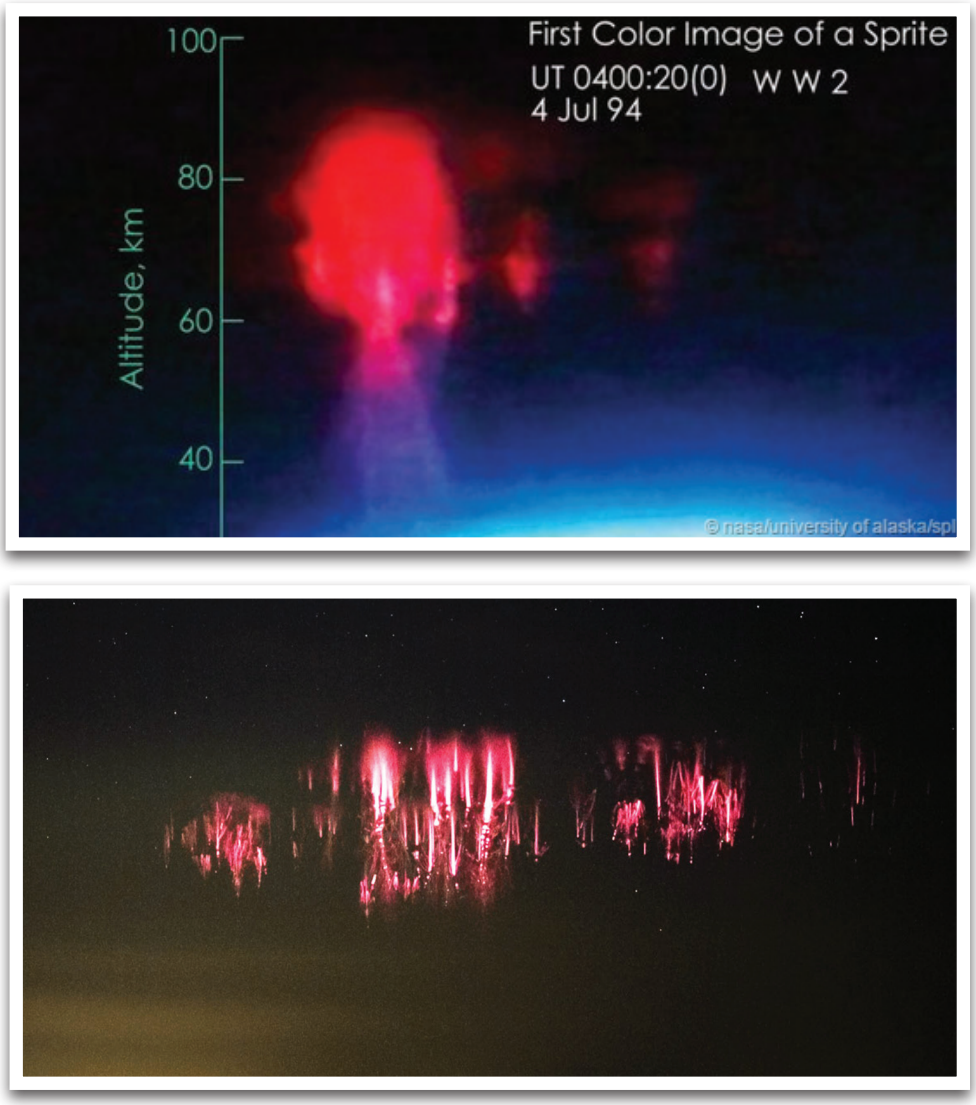
continues from page 47

millisecond. This is centred at about 70 km above the initiating lightning strike. The halos are thought to be produced by the same physical process that creates the sprites. Research at Tohoku University found that Very Low Frequency (VLF) emissions occur at the same time as the sprites, indicating that discharge within the cloud may generate the sprites.

An image of sprites can be seen at the end of the following video clip:

https://www.youtube.com/watch?v=E14OZ95hqGA

More sprites at:
https://www.youtube.com/watch?v=brh--gYjZts



Sprites photographed from Earth

The lightning discharges in the upper atmosphere are known as Transient Luminous Events (TLEs) which are electrically induced forms of luminous plasma. These discharges in the upper atmosphere lack several of the characteristics of the natural tropospheric lightning.

In addition to the sprites, there are also three types of jets and even Emission of Light and Very low-frequency Perturbations due to Electromagnetic Pulse Sources (ELVES) which occur high up in the ionosphere.

Blue jets were first recorded in 1989 by a space shuttle as it passed over Australia. Blue Jets are brighter than sprites but occur much less frequently and are initiated as regular lightning discharges between the upper positive charge region in a thundercloud and a negative 'screening layer' above this charge region, and propagate upward. The blue colour is believed to be due to a set of blue and near-ultraviolet emission lines from neutral and ionised molecular nitrogen.

Blue starters are a shorter and brighter form blue jets reaching up to altitudes of only 20 km.

Gigantic jets are believed to initiate between the upper positive and lower negative charge regions in the thundercloud. In a similar process to how blue jets form, the higher charge region is discharged by the leader network before the same occurs in the lower charge region, and one end of the leader network propagates upward from the cloud toward the ionosphere.

Gigantic jets can reach into the ionosphere, and the colour of the upper portion can change from blue to red. A large number of massive jets have been photographed.

ELVES often occur in the ionosphere at an altitude of 100 km over thunderstorms. These appear as a dim, flattened, expanding glow of about 400 km diameter lasting typically for one millisecond. These were first recorded from a shuttle mission on 7 October 1990. They are red, generated by the excitation of nitrogen molecules due to electron collisions, possibly having been energised by the electromagnetic pulse caused by a discharge from an underlying thunderstorm.

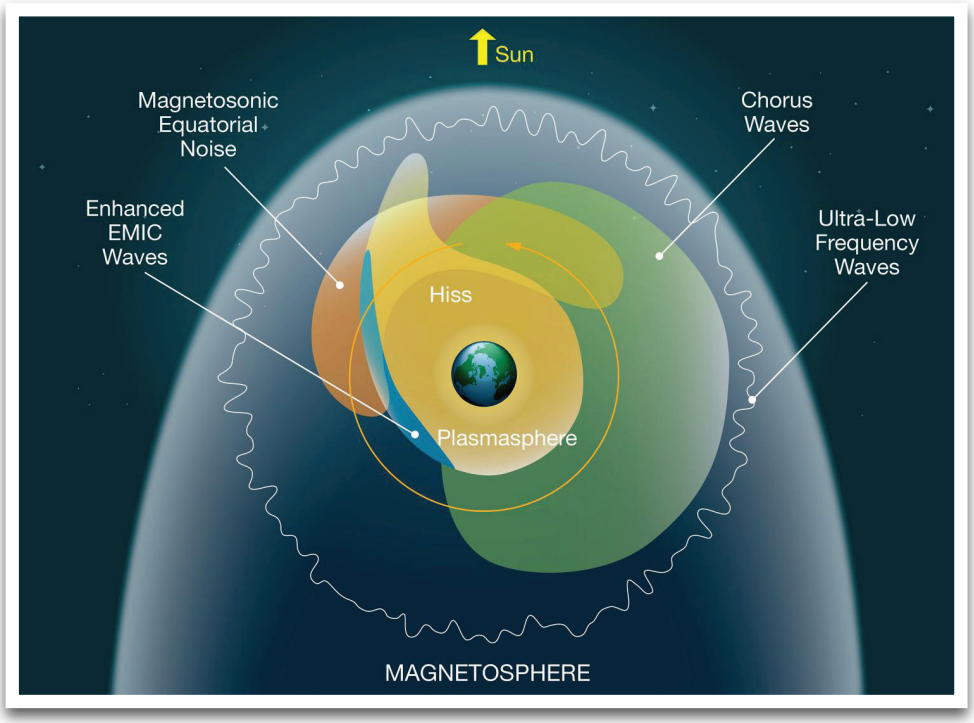
LIGHTNING WHISTLERS

Whistlers are VLF electromagnetic waves generated by lightning. The frequencies of terrestrial whistlers are from 1 kHz to 30 kHz with a maximum amplitude occurring between frequencies of from 3 kHz to 5 kHz. If these signals are converted to audio sound, they produce ghostly whistles, hence their name.

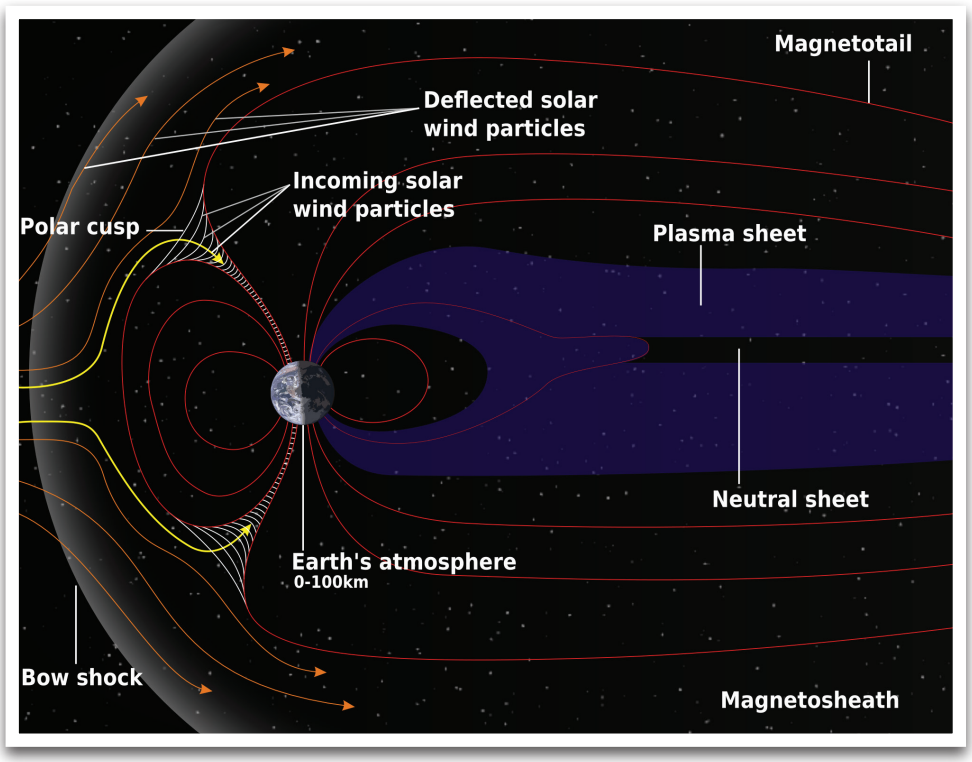
Whistlers were first detected during World War One. The first spectrogram through which whistlers were heard was taken from a 48-second long nightside plasmaspheric pass on 26 March 1996 at a frequency below 1,5 kHz.

They are produced mostly by intra-cloud and return-path strikes where the impulse travels along the Earth's magnetic field lines from one hemisphere to the other. They undergo dispersion of several kHz due to the slower velocity of the lower frequencies through the plasma environments of the ionosphere and magnetosphere. This causes them to be heard as a descending tone for a few seconds.

Voyager 1 and 2 spacecraft detected whistler activity in the vicinity of Jupiter implying the presence of lightning there.



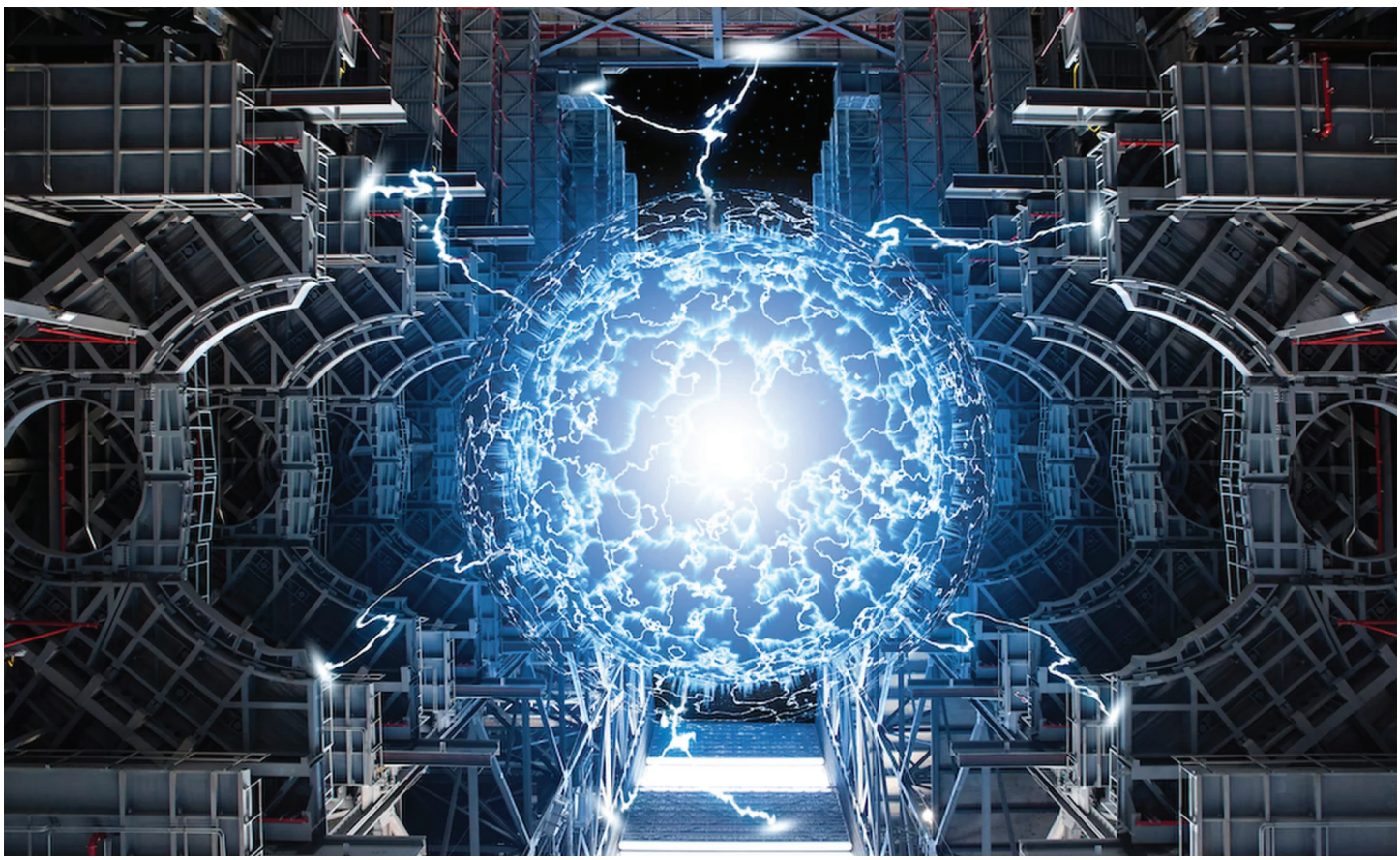
Different types of plasma waves triggered by various mechanisms, occupy different regions of space around Earth.



Earth's Magnetosphere Schematic.

Lightning Sprites

continues from page 49



A conceptual photo of fucsion energy inside a tokamak, the doghnut-shaped machine that produces plasma for fusion energy.

The paths of the whistlers reach into space as far as 3 to 4 times the Earth's radius in the plane of the equator and return the energy from the lightning discharge to the Earth at a point in the opposite hemisphere which is the magnetic conjugate of the position of radio emission for the whistlers.

From there, the whistler waves have reflected the hemisphere from which they started. The energy is almost entirely reflected from the earth's surface 4 or 5 times with increased dispersion and diminishing amplitude until fully attenuated. Along with such long paths, the speed of propagation of energy is between one and ten percent of the speed of light and the exact value depends upon frequency.

The low-frequency whistlers, when converted to sound waves sound quite spooky and can be heard using the following URL:
https://www.youtube.com/watch?v=Gto5n8eBn68

The DIII-D is a tokamak that has been operated since the late 1980s by General Atomics in San Diego, USA, for the U.S. Department of Energy. The DIII-D National Fusion Facility is part of the ongoing effort to achieve magnetically confined fusion.

The challenge of fusion energy is often equated to capturing - and holding - lightning in a bottle. Lightning and a fusion energy plasma have much in common. Similarities include very high temperatures, large electric charges, and extremely complex fluid dynamics. Researchers at the DIII-D National Fusion Facility found another characteristic shared between the two types of plasmas: an electromagnetic wave known as a whistler. If their theories are correct, the whistler discovery could help better understand runaway electrons in tokamaks. It could even help control these destructive particles.

Runaway electrons are a significant concern for future large tokamak devices such as ITER. These electrons must be mitigated due to their potential to cause substantial damage to the walls of plasma-confining tokamaks. Researchers at DIII-D and other

The ITER (International Thermonuclear Experimental Reactor).

fusion facilities are exploring approaches to controlling runaways. While much work remains to be done, the team thinks there is a way to inject whistlers into a plasma to control runaway electrons. The whistlers would bleed energy from the particles, making them less likely to run away.

The operating parameters at DIII-D are impressive: Plasma current – 2 MA, Toroidal magnetic field – 2,2 T, Plasma heating – 23 MW.

In June 2018, UK-based Tokamak Energy claimed that the ST40 reactor achieved a plasma temperature of 15 million K – hotter than the core of the Sun. It is hoped that next year temperature of 100 million K will be achieved. Co-founder David Kingham declared: *"It was terrific to see the data coming through and being able to get the high-temperature plasmas – probably beyond what we were hoping for."*

Fusion power could make all other forms of power generation obsolete. Fifty kg of tritium and 33 kg of deuterium could produce a GW of power for a year, while the amount of heavy hydrogen fuel in the reactor at any one time would only be a few grams.

On 18 May 2018, Live Science contributor Marcus Woo wrote of *"Ghostly lightning waves discovered inside a nuclear reactor."* The paper described *"Whistler Waves"*, typically found in the ionosphere, inside a tokamak nuclear fusion reactor.

The ITER (International Thermonuclear Experimental Reactor) is a project in southern France. First plasma is expected to be achieved by 2025. Scientists hope it will be the first fusion machine to produce more energy than is used to heat the plasma. ITER is a mega project which will be the world's most massive magnetic confinement plasma physics experiment. It is an experimental tokamak nuclear fusion reactor which is being built next to the Cadarache facility in Saint-Paul-lès-Durance, in Provence, southern France. Cadarache is the most significant technological research and development

Lightning Sprites

continues from page 51

centre for energy in Europe including CEA research activities and ITER. CEA Cadarache is one of the ten research centres of the French Commission of Atomic and Alternative Energies. Several groups have set their sights on achieving net positive fusion energy (500 MW) by 2050.

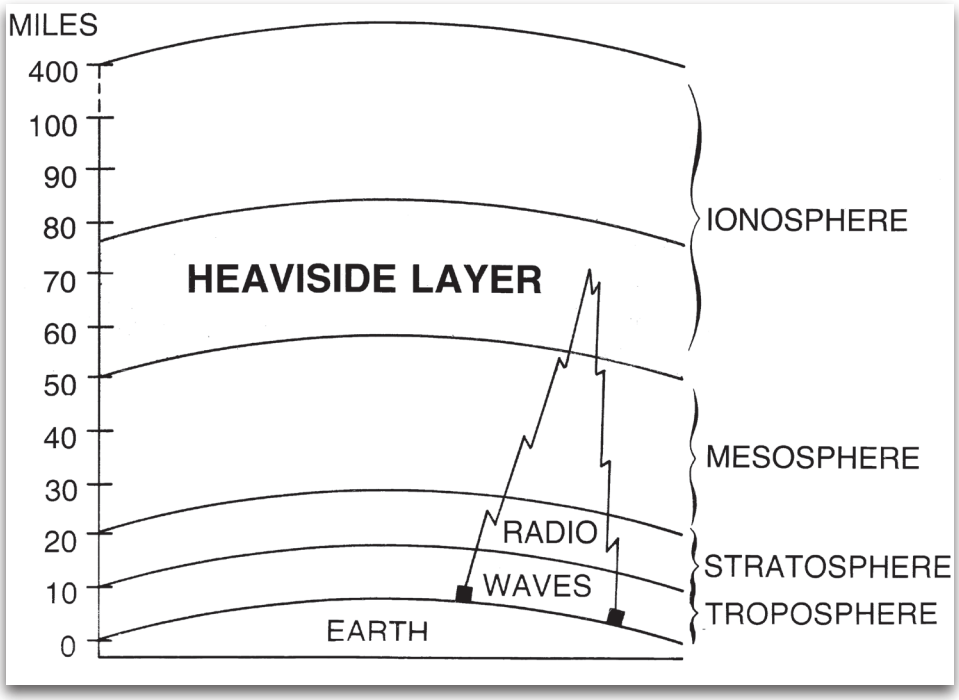
Schumann Resonances (SR) are a set of spectrum peaks in the Extremely Low Frequency (ELF) portion of the Earth's electromagnetic field spectrum. Lightning discharges generate these global resonances in the cavity formed by the Earth's surface and the ionosphere.

This global electromagnetic resonance phenomenon is named after physicist Winfried Otto Schumann (1888-1974) who predicted it mathematically in 1952. The resonances occur due to the space between the Earth and the conductive ionosphere acting as a closed waveguide.

The dimensions of this waveguide act as a resonant cavity for electromagnetic waves in the ELF band which are naturally excited by electric currents in lightning at frequencies from 3 Hz to 60 Hz. Distinct peaks are at 7,83 Hz (fundamental), 14,3 Hz 20,8 Hz 27,3 Hz and 33,8 Hz.

Observations of Schumann resonances have been used to track global lightning activity.

Owing to the connection between lightning activity and the Earth's climate, it has been suggested that they may also be used to monitor global temperature variations and variations of water vapour in the upper troposphere. It has been speculated that extraterrestrial lightning (on other planets) may also be detected and studied using their Schumann resonance signatures. Schumann resonances have been used to study the lower ionosphere on Earth, and it has been suggested as one way to explore the lower ionosphere on celestial bodies. Effects on Schumann resonances have been reported following geomagnetic and ionospheric disturbances.



The Kennelly-Heaviside layer

The Kennelly-Heaviside layer, named after Arthur Kennelly (1861-1939) and Oliver Heaviside (1850-1925) is one of several layers of ionised gas in the ionosphere, occurring roughly 90 km to 150 km altitude.

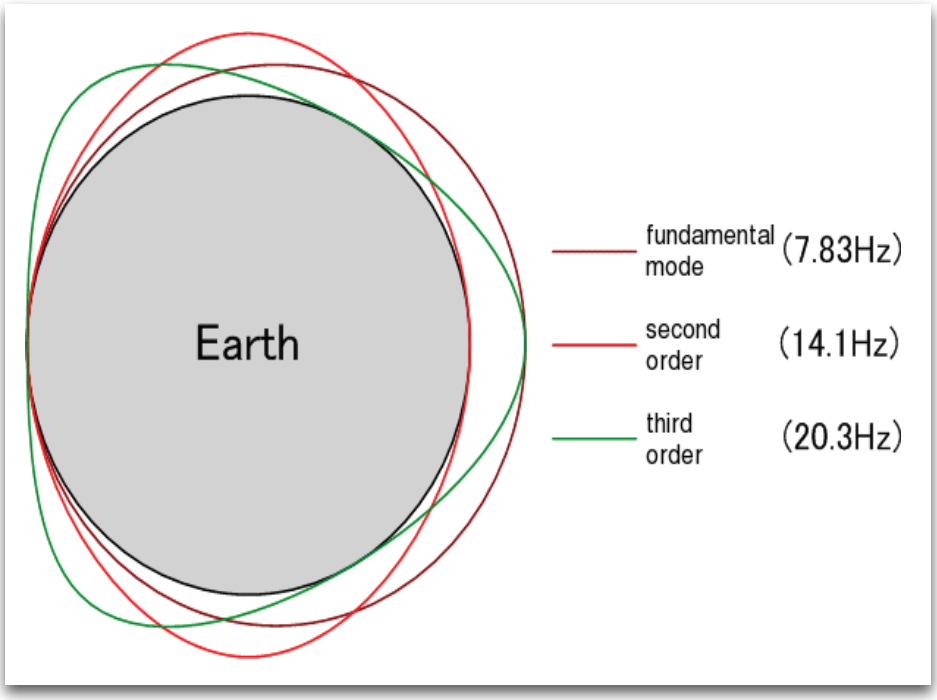
The layer is at a lower altitude by day and higher by night which affects radio transmissions. The layer also changes seasonally and is influenced by sunspot activity. This layer, first predicted in 1902, was shown to exist by Edward Appleton in 1924, for which he was awarded the 1947 Nobel Prize in Physics.

The Heaviside layer is used extensively for medium-frequency long distance (shortwave) radio communications.

Heaviside was a remarkable personality of the early days of electrical physics and engineering and is also famous for his reformulation of the Maxwell equations using vector algebra instead of Hamilton's quaternions favoured by Maxwell.

There has been much speculation that Nikola Tesla's Wardenclyffe tower was designed to transmit electrical power around the globe using the Schumann resonance cavity.

The power would be available at any place on Earth, including ships at sea. The tower was unfortunately demolished in 1917 before it could be put to practical use. Efforts to revive this idea have met with much scepticism; however Russian



Schumann Resonances in Earth's atmosphere.

scientists have pursued the matter further.

The idea of using the entire Earth as part of an industrial power distribution system may seem absurd, but it must be remembered that the Earth, as a spherical capacitor, has a capacitance of only 700 microfarads.

Tesla commented: "*This planet, with all its appalling immensity, is to electric currents virtually no more than a small metal ball.*"

More recently, discrete Schumann resonance excitations have been linked to transient luminous events – sprites, ELVES, jets and other upper-atmosphere lightning. A new interest in Schumann resonances is related to short-term earthquake prediction and possibly a correlation between resonant frequency and tropical air temperatures, suggesting a method to monitor global warming. wn

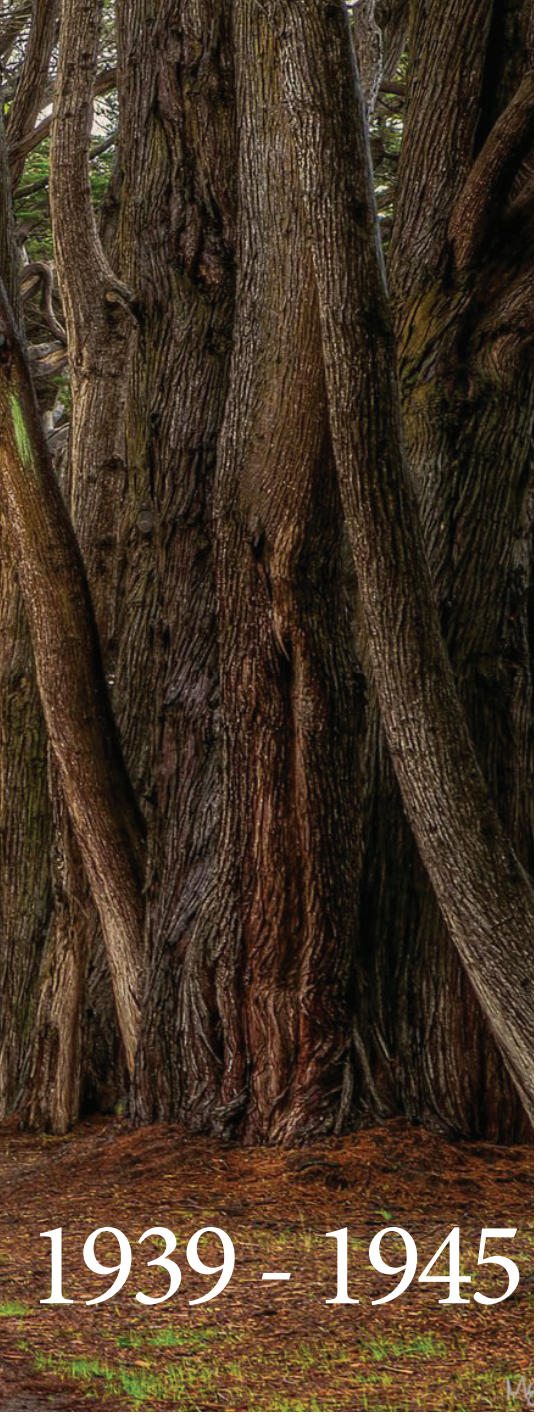
Down Memory Lane

Portrait of an Engineer

BY | FRED CATLOW | MSC | FSAIEE

I did have some Meccano which I fiddled with in later years. I didn't play with it much because there wasn't much to play with, not enough pieces to make anything worthwhile such as a crane for lifting things - it wasn't possible to purchase more pieces, as Meccano was unobtainable during the war. I did build 'roads', 'tunnels' and 'bridges' in the tiny rockery garden in front of the house (my father had previously paved half of it to make a shop front when he started his business) for my 'Dinky' cars. These were not the big plastic cars that children have nowadays, but small, realistic metallic cars. Plastic hadn't been invented back then anyway, and there were more important things to occupy people than worrying about children sucking toys which may have had lead paint on them. I don't remember ever sucking my toys, especially if they were muddy from the garden.

My middle sister, Joyce, who was more than five years older than me, used to escort me to infant school but by the time I started 'big school,' she left to go to Accrington High School. For a time, I was escorted by the girl next door until I was old enough to walk myself.



I doubt if I showed much promise as a budding engineer during my early years. At infant school I did build structures from wooden blocks, as most children do, others knocked them down into the sand pit, and disputes would ensue until the teacher intervened. Then there was peace in the middle of the afternoon when we all had to lie down for a quiet period before we went home at half past three. I had to wait until 4 for my sister to collect me.

Big school was different; I could not do as I pleased any more, we were disciplined, with different teachers for arithmetic, poetry and singing, reading, religious instruction and so on, we also had a drill every day in the school playground during the morning break. It was called PT (physical training), we had to line up in our classes, in the schoolyard to do 'physical jerks' which involved swinging our arms, touching our toes etc. There was no swimming pool or sports facilities at the school, so we had to march down to the public baths in the town or to the sports field in the opposite direction for team games. We were all issued with gas masks and instructed in an emergency drill. Refugee children who spoke different dialects (mainly from the dock areas that were subject to enemy bombings such as Salford, Liverpool and the East End of London) arrived at our school.

We even had a real foreigner, a boy from the Netherlands. When I befriended him, I was told by my classmates to be careful as he might be a German spy. We didn't quite know how to take the newcomers,

Down Memory Lane

continues from page 55

they weren't the same as us and although we were poor working class many of the refugees were from dockland slums and were different in many ways.

A childless paternal aunt and uncle 'did their bit' by taking in a refugee from Salford. When he first arrived was in a sorry state; my aunt kitted him out with new clothes, de-loused him, bathed him, attended to his teeth, had him checked over by the doctor and generally made him presentable and in good fettle. However, since Salford is adjacent to Manchester and only 25 miles away, he went home from time to time, and each time he did, his mother would sell his new clothes, and he would return in rags, so my aunt had to go through the entire procedure again and again.

Although I was very young, I remember the start of the war - people were going around with long faces, and there was lots of gossip. Their anxieties were not surprising as the pain of the Great War, a mere 21 years previously, was still fresh in their memories. It was 23 years since the Accrington Pals Battalion was almost annihilated at the Battle of the Somme and nearly every household in the town had lost a father, uncle, son and/or brother. The cobbled streets of terraced houses adorned with black curtains symbolised all too well the agonising losses. People were fearful of a repetition.

Not a lot happened in the beginning. The few garden railings that we still had, were removed to be melted down for the production of armaments. We constructed a brick air raid shelter with a flat concrete top in the street outside our house. It had no windows, and we found it useful for playing cricket. We chalked wickets and stumps on it and played in the street with an old tennis ball. We also used an old tennis ball to play football. It was one of the few transverse streets that were reasonably level as the adjacent streets of terraced houses rose fairly steeply in parallel lines from the town up to the Coppice and the Pennine Hills beyond. We used our jackets for 'goal posts' and if a car came past, we would grab them, but sometimes they got run over. Due to the rationing of petrol, there weren't many cars as few people owned them.

It wasn't always possible to play outside as it rained a great deal and I used to occupy myself with indoor pursuits, such as 'colouring-in books', making pictures, doing jig-saws, playing board games with my siblings or sliding down the bannister rail.

I remember standing with my parents outside the house, one night in December 1940 and seeing the glow in the sky as German planes dropped flares and bombed Manchester. It was during the blackout, and we could see very clearly the glow in the sky even though it was over twenty miles away. We could also hear the drone of their planes from time to time.

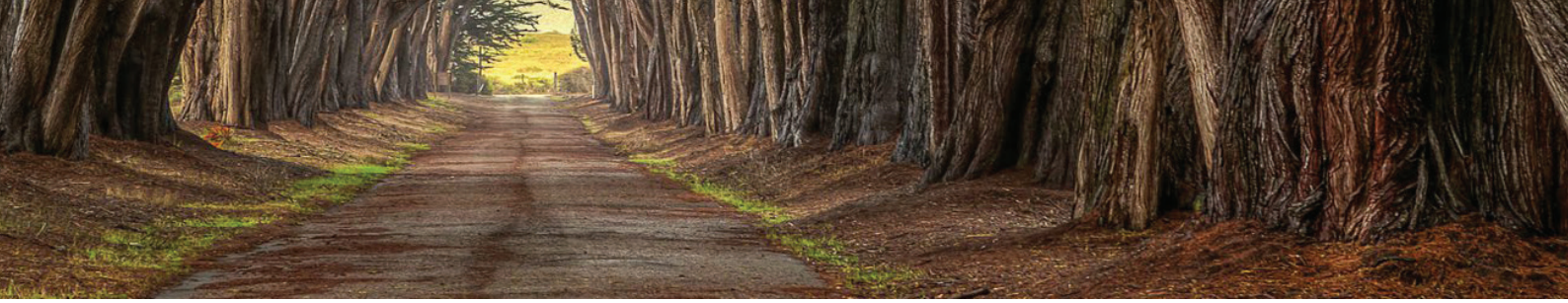
I began to take an interest in war machines, especially aeroplanes. I learned the names of the German planes, such as Dornier, Focke-Wulf, Junkers, Heinkel, Messerschmitt and so on. Being British, my real inspiration was the British aeroplanes, Avro Anson, Blackburn Skua, Boulton Paul Defiant, Bristol Beaufighter, de Havilland Mosquito, Fairey Swordfish, Gloster Gladiator, Handley Page Halifax, Vickers Wellington and of course, the Hawker Hurricane, Supermarine Spitfire and the Avro Manchester and Lancaster bombers. The Germans never made a four-engine plane to compare or compete with the Lancaster.

My parents bought me a large book with a pull-out isometric of the various aeroplanes. British aviation companies and their designs were comprehensively listed. There were twenty different aviation companies in Britain. Between 1935 and 1945 they produced 83 designs, some of which never left the prototype stage or even the drawing board, but others were world beaters which were sold to many different countries all over the world. The ingenuity and innovation of the British designers and engineers were extraordinary.

My brother, who spent a great deal of time in hospitals and convalescent homes because of a problem with his right leg, devoted much of his time to making model aeroplanes with balsa wood. On one occasion, a nurse asked him for the plane that he was building, and he said, "No, that's for my little brother". Within days I had smashed it to pieces, typical child! Later he made flying models from kits of lightweight strips and covered with a stretched fabric, powered by one or more propellers wound up by elastic bands.

I was also interested in ships, especially as my father had served in the Royal Navy during the First World War. He was on a 'minesweeper' clearing the North Sea of mines and was based at Scapa Flow in the Orkney Islands in the Far North of Scotland.

When he returned home in 1919, he started his own bakery business and opened a shop to sell his produce, all from the two storey house previously owned by my grandparents, where we lived.



Both my parents were wholly absorbed in the business, and we were left pretty much to our own devices, although my eldest sister, Doris, who was eleven years older than me was 'little mother' and kept us in order. It was not unusual at that time for young children to supervise their younger siblings as their fathers were in the armed services and their mothers worked full time in the mills and factories. Schools finished for the day at 4 pm, and the factory shifts only ended at 6 o'clock. Often the mothers had to work night shift which made things even more difficult, and children took on responsibilities at a very early age.

The war years were exceptional for me because it was the only time the whole family was together. We went to church together on Sundays and afterwards we each had our chores to do, dusting and cleaning before we sat down to Sunday lunch. Towards the end of the war, my sister Doris had already left school and was working away from home for the Admiralty in Naval Victualling. Most of the service clothing stores were moved inland from Liverpool to avoid the bombing, and she was based at Risley. In 1945 she met a local boy who was in the Eighth Army serving with Field Marshall Montgomery in North Africa and later in Italy and Palestine. They were married in 1948 and emigrated to Australia in 1951. One by one family members left home until there were only myself and my youngest sister, Julie, five years my junior.

I think the last time the family were all on the annual holiday together was at Fleetwood in 1944. My father used to close-up shop for Accrington wakes week, a time when all the factories and mills in the town became silent, their chimneys stopped smoking, and almost all the townsfolk went to the seaside. It was a cause for great excitement, and my mother often stayed up all night to complete the holiday clothes that she was making. The cases were always overstuffed, and we had to sit on them to fasten the clasps. The taxi would then arrive to take us to the railway station. It was the only time during the year that my father let the fires for his baking ovens die down, but even though we only went away for a week, towards the end of it, he began to get anxious to re-light his ovens ready for opening the shop on Monday morning.

The most popular destinations were Blackpool, Lytham-St Annes, Fleetwood, Morecambe and Southport - places that were within easy reach of a two-hour train journey. I have fond memories of Fleetwood's boating lake where my brother and I could sail our model yachts. The pier, and most of the beach, was 'out of bounds' - blocked off by barbed wire and obstacles meant to deter any invasion, planned or otherwise. The Home Guard ('Dad's Army') were on patrol.

The bedroom that I shared with my siblings had a vast, ornate organ, probably too big to move when my grandparents moved out and on its shelves was a veritable arsenal of lethal trophy weapons, swords, bayonets, helmets etc., to play with, that presumably had been obtained from previous encounters. Bearing in mind Churchill's words, "..We will fight them on the beaches …. we will never surrender!" even though I was only young, I was ready willing and able. There was a cupboard in the bedroom. It had drawers underneath in which I kept my toys, games and books, the top part had two outward opening doors and one of my favourite games, when friends came around, was to climb into the darkened cupboard with my friend sitting opposite. We closed the doors for 'take off' and would 'fly to Germany' and then parachute 'over Berlin' leaping onto my bed. Sometimes, I would put a dart board on the floor, and we would 'bomb Berlin' with darts – such is the imagination of children.

Almost every week my mother would buy me magazines depicting the war; the Abyssinia campaign, the London blitz and so on but also *"How to draw books"*. My favourite was *"How to draw Horses"*, but I had *"How to draw Planes"*, *"How to draw Ships"*, *"How to draw Tanks"* etc., my collection eventually must have totalled about forty different books.

Although we had electric lighting, (we still had pipes for gas mantles protruding from the wall in my bedroom) we had no television or labour saving devices. We did, however, have a radio controlled by large thermionic valves, and on that, we could listen to Churchill's inspirational speeches. There was a programme each evening at nine o' clock called *"Into Battle"* introduced by the march 'Lilliburlero', compered by John Snagg or Alvar Liddell and I begged my parents to let me stay up to listen to it. I followed avidly every step of the war. It made me proud to be British.

Meanwhile, my brother decided to concentrate on French study at school, and he was keen on stories of the heroics of the French resistance, especially those of Jean Moulin and the fighters in the Alpes Maritimes and the Rhone Valley.

In December 1941, Pearl Harbour was bombed by the Japanese. As a consequence of that, America entered the war, and we were no longer fighting alone in Europe

Down Memory Lane

continues from page 57

against the Axis powers comprising Germany, Austria, Hungary, Italy. Romania and Bulgaria (not to mention 'Vichy France'). There were new war machines to add to my list, the Boeing Flying Fortress, Lockheed Lightning, North American Mustang and the famous long-lasting Douglas DC3. We even had American servicemen in Accrington. Whenever I was out in the street playing football or cricket with my friends and saw one, I would cheekily go up to him and say, *"Got any gum chum?"* The other children would laugh and giggle.

We played marbles in the street or sometimes would go to local reservoirs to catch 'tiddlers' with a bent pin and a jam jar. We also gathered frog spawn and took it home to watch it grow into tadpoles and tiny frogs. In autumn we used to play conkers, and these were graded depending on how many other conkers were smashed so that a 'champion conker' was worth many marbles. In winter we had snowball fights and tried to hit other boys on their knees where the snowballs would sting if propelled with enough force.

Once we climbed over the fence into a factory yard to get metal stampings, but we were discovered, and a man came rushing out. Everybody scrambled back over the fence, but I was the last, and the man struck out with a steel ruler so when I went home there was a big tear in my pants and my mother had to sew it back together.

It was almost impossible to get anything that wasn't essential. Ladies nylon stockings were worth a 'King's ransom' on the black market. All foodstuffs and many other things were rationed, for which we had ration books with different coloured coupons. My aunt grew vegetables in the little plot at her council house. In fact, many people with a few square feet of back garden grew potatoes or cabbages or even kept hens to provide themselves with eggs. Lord Woolton's cookbook was 'a must have' for everybody. Sometimes we would get crab apples that were overhanging from peoples' gardens. They were incredibly sour, but inevitably one of the boys would 'bag' the stump.

I even saved up all my sweets all year in a tin for the great holiday event. From time to time I would open the lid and take a deep breath of the wonderful aroma. My father struggled to get ingredients for his business and had to make do with milk powder, dried eggs etc., but my parents ensured that we didn't go hungry and since my father was a baker, we never went short of bread, teacakes or pies. Unlike others, my father was not conscripted since he was performing an essential job supplying the workers with bread. Anyway, he had done his stint in the First War. My future brothers-in-law did serve in the armed forces in different theatres of war.

Although we got our daily news from the radio, we also saw the newsreels, Movietone and Pathe Pictorial at the local picture houses. We were able to follow the progress of the war, the battles, the invasion of Europe in the Normandy landings and the gruesome findings at Belsen. The war in Europe ended in 1945 which was the year of my 10th birthday. May 8th was set aside for the official celebration, and my friends and I collected any wood that we could find for a bonfire. We had to scout far and wide to get the wood that we required. At the bottom of our yard my father had a pile of coke which was used to keep his ovens burning, and by climbing up the pile, I could comfortably sit on top of the twelve-foot-high wall. It proved to be the perfect place for keeping our bonfire wood and taking turns to guard it against predators. We didn't have many fireworks, but we were able to burn an effigy on the bonfire at the back of our house with all the neighbours gathering round.

For me, the war was like a game. I was too young to appreciate the suffering and the horror, and although Manchester was bombed, my mother used to take me there on annual visits to see Father Christmas, and I used to rejoice at the decorations and the Hornby electric trains running all over the toy store. Much of the things we could only look at since there was not a great deal available for sale; Meccano, Hornby train sets, Dinky toys and toy soldiers were unobtainable as were fairy lights for Christmas trees. We even had to make our decorations from old cigarette packets, crepe paper and anything that looked like tinsel. Improvisation, make-do and mend was the order of the day. We never had a turkey for Christmas and were extremely lucky if we got a chicken (there were no battery hens then).

Nevertheless, we were relatively safe, thanks to the Royal Air Force guarding our skies. At the end of the war a flying bomb must have gone astray and landed on a house about a mile away at Clayton-le-Moors, but instead of promoting fear, it gave rise to excitement and curiosity. Despite the hardships, the war was a memorable, happy and oddly peaceful part of my life. It was a time of togetherness and unity, and as a future engineer, I did learn to appreciate aeroplanes and other machines of war. wn

UPSKILL TODAY!

Since its inception in 2009, The SAIEE CPD Training Academy has focussed on offering CPD validated courses for ECSA Registered Electrical Engineering Professionals to maintain their professional registration and for those SAIEE members wishing to attend quality courses to gain knowledge and maintain competence in the industry.

With increased progress and growth year on year, the decision was made to include technically related courses to add towards professional development. The SAIEE Training Academy provides training at an affordable cost and will offer any of the available courses for in-house training.

To enquire further or if you would like to be added to the SAIEE Training Academy's mailing list please contact:

SAIEE
TRAINING ACADEMY

Sue Moseley - suem@saiee.org.za | Roberto Benites - roberto@saiee.org.za | www.saiee.org.za

WATT? is a forum related specifically to the industrial and commercial electrical sector.

Do you have any burning questions, topical issues or points of interest about the electrical industry, from the perspective of a contractor, supplier or professional service provider? Submit your comments, thoughts, ideas, suggestions or questions for the attention of our industry experts, and these will be addressed in a future issue of the magazine. This is your forum, and we would like to hear from you!

WATT? is an opportunity for people on the ground to engage with each other and related professionals in an informative and friendly manner. This is a platform for you to discuss anything related to your particular sector, to highlight anything new, or to ask a specific question related to a technical topic or to engage in general industry issues. . Please note that we will not be considering anything related to the domestic sector, such as residential wiring.

Send your burning questions to minx@saiee.org.za - subject 'WATT?'.

QUESTION ONE

What is the difference between a convertor transformer and a distribution transformer?

ANSWER ONE

Distribution transformers are generally designed to cater for standard linear loads that do not have any harmonics. Historically the design was, and still often is, based on the actual load that the unit will see in operation. However today with modern technology, most of the loads contain harmonics, for example electronic switching, air conditioners and Variable Speed Drives (VSDs) to name a few. The harmonics in the load causes extra loading on the transformer above that for which it is rated, and this can cause overheating and failure. To cater for this situation, the load has got to be analysed and considered at transformer design stage. This design will then incorporate lower current and flux densities as well as additional cooling to avoid strain on the transformer. Because of this, a convertor transformer tends to use more materials and is more expensive than a normal distribution type transformer.

QUESTION TWO

What are the main differences between copper wound transformers and aluminium wound transformers?

ANSWER TWO

Traditionally, copper was used in transformer windings as it was easier to repair and had a very high scrap value. The belief was also held that these transformers last longer. Today, it is common for aluminium to be used in a transformer and there are several advantages. These transformers are generally less in price than those with copper windings, due to international metals prices, although they tend to be slightly bigger in size. The aluminium used in transformers has also been improved to ensure that it can operate within the same electrical parameters as those with copper windings. Type tests have also been carried out on these units and have proven that they can work. Because of these factors, aluminium transformers are becoming increasingly popular.

QUESTION THREE

What is the difference between a round core and an oval type core?

ANSWER THREE

There are currently two types of cores available; the round core type and the oval type. The oval core is used on units from 630 kVA and smaller as it is cost effective in this capacity range while still achieving the desired losses. It consists of three sizes of steps which make it faster to stack and make the transformer smaller. Greater than 630 kVA round type cores are preferred. Round type cores are the best for short circuit handling and are used in heavy industries.

The step lap core regular and multi-step is used on units up to 500 MVA and has very low losses due to the effective corner joining. This makes the core smaller which leads to

WATT?

Information provided by Zest WEG Group

savings in capital cost. Ongoing product improvement will see two additional types of cores becoming available in South Africa which will offers increased cost effectiveness with a reduction in stacking time.

QUESTION FOUR

What insulating material is used in transformers?

ANSWER FOUR

Transformers are designed using paper, wood and pressboard as the three main insulating mediums. Paper is used in most of the areas as it is easily modified, wrapped, folded and even bent. Transformer insulating paper is being continuously improved to last longer while maintaining its insulating properties over the lifespan of the transformer. Improvements include greater breakdown kV strength, lesser moisture retention and less degradation under hot oil conditions when the transformer is in operation.

QUESTION FIVE

What are low loss transformers?

ANSWER FIVE

Transformer that have significantly lower losses than the ones stipulated in the national standards are generally referred to as low loss transformers. There are certain losses tabled for different sized transformers in the SANS 780 as a guide to be used by both manufacturers and customers, but modern engineers require units with losses lower than these, hence the term low loss transformers. Low loss transformers are becoming more common as these offer the advantage of lower cost of ownership. While the initial cost may seem higher, with optimised design and appropriate capitalised losses calculations, the overall cost of the unit is less.

Transformer losses are categorised as no-load losses (iron losses) and load losses (copper losses). Iron losses include losses due to no-load current, hysteresis losses and eddy current losses in core laminations, stray eddy current losses in core clamps and bolts, and losses in the dielectric circuit.

Load losses include losses due to load currents, losses due to current supplying the losses, and eddy current losses in conductors due to leakage fields. Transformer losses are very important to the end user because they have huge cost implications. Reduction in losses can be achieved through better transformer design in one or more of the following ways:

- Use of more conductor area,
- Use of lower loss conductor materials or winding methods,
- Decrease in current path length,
- More core area,
- Decrease in core flux density,
- Decrease in flux path length,
- Lower loss core material,
- Better quality materials e.g. armouphous core and
- Improved manufacturing techniques to ensure transformer loss is reduced.

QUESTION SIX

What is a mini-substation and what are its limits?

QUESTION SIX

A mini-substation is a compact factory-assembled and tested, free-standing unit that is suitable for use in an area accessible to the public. It comprises a transformer, an equipped medium-voltage compartment and an equipped low-voltage compartment and is suitable for connection to underground cables. Currently the specification is limited to a 1,000 kVA @ 22 kV; this is to ensure that it can be accommodated on the standard plinths that are used and for ease of replacement of mini-substations. Up to this size, there are certain limiting dimensions that must be adhered to.

Over the past three to five years, interested has been shown in mini-substations up to 2,000 kVA predominantly from a cost savings perspective. As no dimensional or specification limitations exist, individual OEMs base designs on the national standard and extrapolate from there. The larger the mini-substation, the more difficult it is to design from a high current capacity and cooling radiator perspective. wn

DECEMBER

December was originally the tenth month of the year in the Roman calendar until a month-less winter period was divided between January and February. It gets its name from the Latin word "decem" which means tenth. However, when the Romans added January and February to the calendar, it became the twelfth month.

COMPILED BY |
JANE BUISSON-STREET
FSAIEE | PMIITPSA | FMIITSPA

1 DECEMBER

1939 Gone With The Wind made its world premiere in New York.

2 DECEMBER

1927 After 19 years of Ford Model T production, the Ford Motor Company unveiled the Ford Model A as its new automobile.

3 DECEMBER

1927 *'Putting Pants on Philip'*, the first Laurel and Hardy film, was released.

4 DECEMBER

1791 The first edition of Britain's *'The Observer'*, the world's first Sunday newspaper, was published.

5 DECEMBER

1924 SAIEE's Annual Dinner was held at the Carlton Hotel.

6 DECEMBER

1768 The first edition of the Encyclopædia Britannica (Latin for "British Encyclopaedia") was published under the title *"Encyclopedia Britannica,* or, *A dictionary of arts and sciences, compiled upon a new plan."*

7 DECEMBER

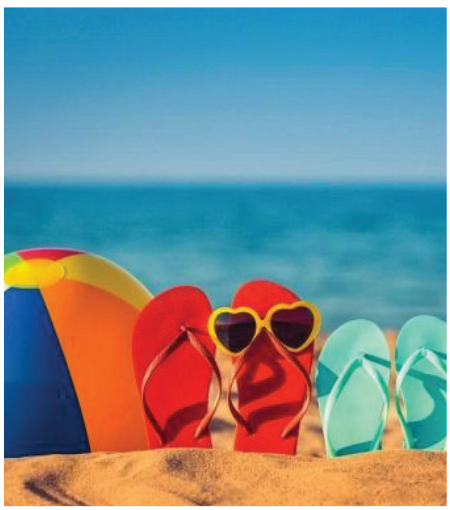
1732 The Royal Opera House opened at Covent Garden, London, England.

8 DECEMBER

2010 The Japanese solar-sail spacecraft, IKAROS, passed the planet Venus at a distance of about 80,800 km.

9 DECEMBER

1960 The first episode of Coronation Street, the world's longest-running television soap opera, was broadcast in the United Kingdom.



10 DECEMBER

1799 The metre was adopted as France's official unit of length.

11 DECEMBER

1979 Great Britain granted independence to Zimbabwe (Rhodesia).

12 DECEMBER

1918 Mr John Hubert Davies, referred to as *"one of the few remaining and best-known pioneer electrical engineers"* in South Africa, died.

13 DECEMBER

2013 The body of former President of South Africa, Nelson Mandela, was flown from Pretoria to his ancestral village of Qunu, his final resting place.

14 DECEMBER

1972 During the last manned mission to the moon of the 20th century, Eugene Cernan became the last person to walk on the Moon. He and Harrison Schmitt completed the third and final Extra-vehicular activity (EVA) of Apollo 17.

15 DECEMBER

1903 The Wright Brothers made their first attempt to launch the Wright Flyer in Kitty Hawk, North Carolina.

16 DECEMBER

2009 Avatar (a 2009 film) was released internationally. It was the first film to gross $2 billion.

17 DECEMBER

1969 The United States Air Force (USAF) closed its study of the UFO phenomena, known as *"Project Blue Book."* The conclusion was that prior extra-terrestrial life sightings were the result of *"a mild form of mass hysteria"* and that there are *"individuals who fabricate such reports to perpetrate a hoax or seek publicity."*

18 DECEMBER

2002 New Line Cinema released the fantasy film "*The Lord of the Rings: The Two Towers*".

19 DECEMBER

1905 The first-ever motorised ambulance service for road accident victims was set up in London.

20 DECEMBER

1972 Steve Jobs dropped out of Reed College, Oregon, USA, after attending for only one semester.

21 DECEMBER

1913 Arthur Wynne's "word-cross", the first crossword puzzle, was published in the New York World.

22 DECEMBER

1891 Asteroid 323 Brucia becomes the first asteroid discovered by photography.

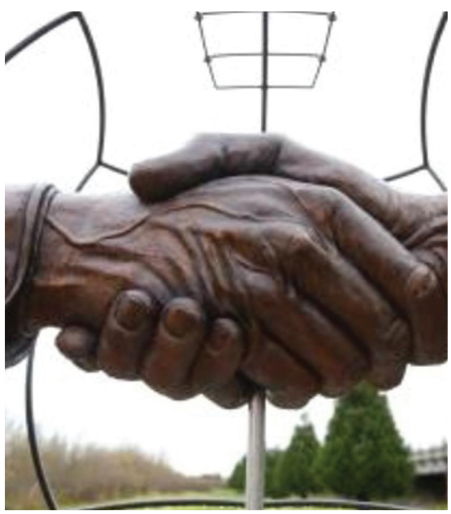
23 DECEMBER

1750 Benjamin Franklin was severely shocked while electrocuting a holiday turkey. He believed electrocuting the turkey would make it uncommonly tender.

24 DECEMBER

1914 World War I: The *"Christmas Truce"* began. It was a series of widespread, unofficial ceasefires that took place all along the Western Front over Christmas 1914, during World War I.

Throughout the week leading up to Christmas, parties of German



December

continues from page 63

and British soldiers began to exchange seasonal greetings and songs between their trenches.

On occasion, the tension was reduced to the point that individuals would walk across to talk to their opposite numbers bearing gifts.

25 DECEMBER

1800 Queen Charlotte put up Britain's first Christmas Tree at Windsor.

26 DECEMBER

1982 TIME magazine's Man of the Year was a computer.

27 DECEMBER

1975 The Four Seasons single, *"December 1963 (Oh, What a Night)"* was released.

28 DECEMBER

1065 Westminster Abbey was consecrated under Edward the Confessor.

29 DECEMBER

1852 Emma Snodgrass was arrested in Boston for wearing pants. When asked why she dressed as a boy, she replied: *"Can get more wages."*

30 DECEMBER

1973 Anita Loos, author of Gentlemen prefer Blonds stated *"I'm furious about the Women's Liberationists. They keep getting on soapboxes and proclaiming women are brighter than men. That's true, but it should be kept very quiet, or it ruins the whole racket."*

31 DECEMBER

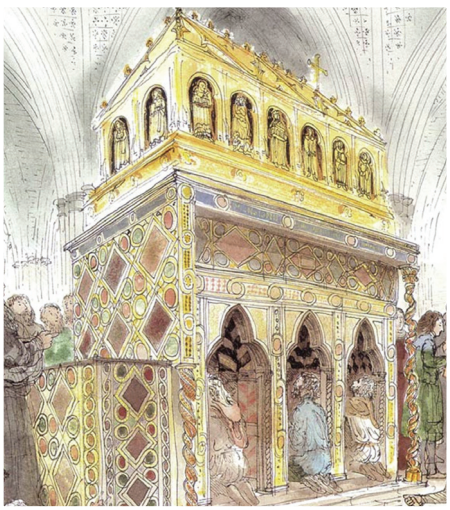
1687 The first Huguenot emigrants, the first to arrive in South Africa set sail from France. They took with them vines to start a wine industry in their new colony. wn

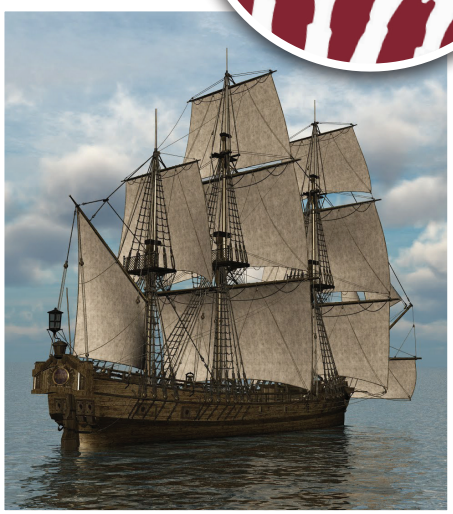
I wish you abundance, happiness, and peace in a new year filled with hope.

Happy holidays!

I hope you and all your coworkers, family, and friends have a lovely holiday season filled with joy and meaning.

Best wishes for a prosperous new year.
JBS





Why use us for Mentorship?

what's in it for me?

FOR THE MENTOR

- The SAIEE Member is a senior experienced professional
- The SAIEE Member is a:
  - Professional Engineer, or
  - Professional Engineering Technologist, or
  - Professional Engineering Technician or
  - Professional Certificated Engineer
- A mentor is a trusted advisor whose role is to guide and facilitate the professional development of the candidate
- The SAIEE Mentor is able to Manage a candidate by developing skills and competence in the work place

SAIEE OFFERS:

FOR THE MENTOREE

- Work Integrated Learning (WIL) for University of Technology and Comprehensive University Student Technicians
- Development in various engineering arenas
- Comprehensive work related mentorship aimed at Professional Registration with ECSA
- Supplementary training to enhance technical and soft skills
- The scope of Mentorship covers four sub-disciplines:
  - Power
  - Electronics (Control & Instrumentation)
  - Telecommunications
  - Computer and Software

SAIEE

011 487 3003 | www.saiee.org.za

Bloemfontein Centre
Chairman | Dr Kanzumba Kusakana
T|051 507 3088 **E**|kkusakana@cut.ac.za

Eastern Cape Centre
Chairman | Jacques van der Heide
T|041 404 3326 **E**|vdheidj@eskom.co.za

Gauteng Central Centre
Chairman | Lehlohonolo Mashego
E|mashegol@gmail.com

Kwa-Zulu Natal Centre
Chairman | Zola Ntsahngase
T|(033) 347-0000 **E**| zola@zmlafrica.co.za

Mpumalanga Centre
Chairman | Louis Kok
T|017 619 2607 **E**| louis.kok2@sasol.com

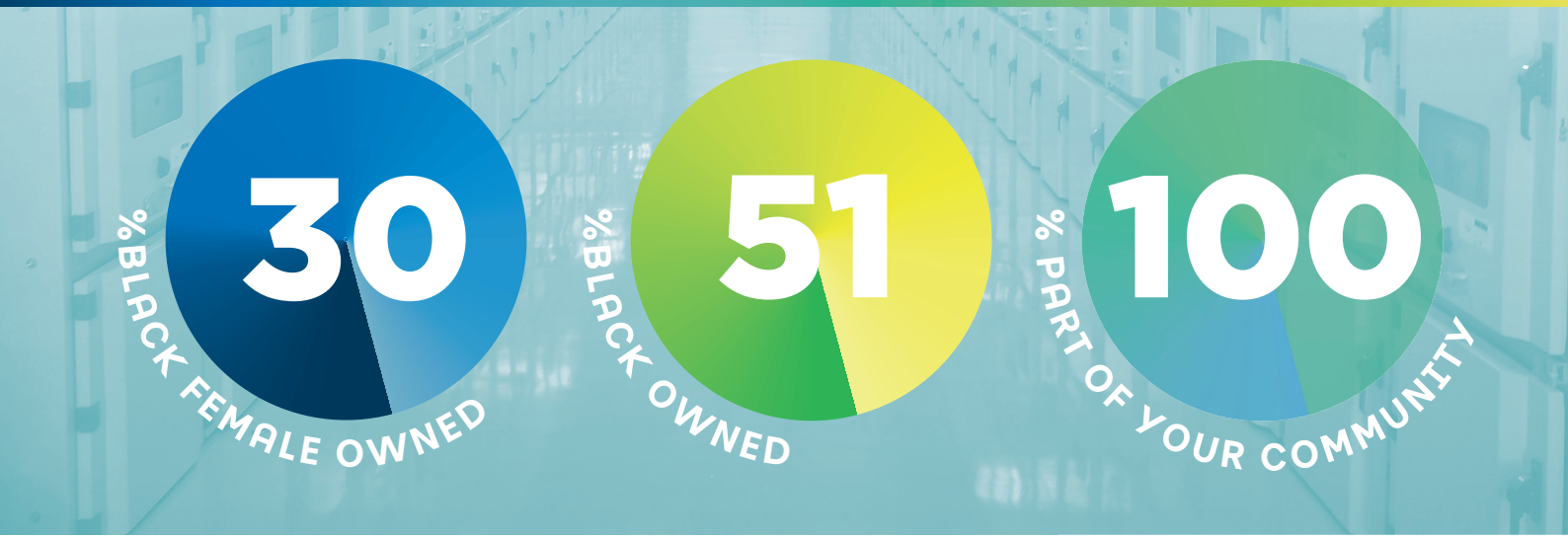
Northern Cape Centre
Chairman | Ben Mabizela
T| 073 708 0179 **E**| MabizeBG@eskom.co.za

Southern Cape Centre
Chairman | Johann Swanepoel
T| 0448714925 **E**|jgfswanepoel@gmail.com

Vaal Centre
Chairman | Martinus Beumer
T|083 256 7177 **E**|martinus.beumer@proconics.co.za

Western Cape Centre
Chairman | Joyce Mtimkulu
T| 087 820 3555 **E**|joymtimkulu@yahoo.com

Proconics being Brilliant in Africa



Brilliance excites us! For today and for the future.

We are a South African-based, multidisciplinary engineering contracting company providing professional, effective and high-quality engineering services in the Instrumentation, Electrical and Mechanical fields. We are agile and adaptable, and our extensive experience in complex brownfields projects equips us to approach each project with a tailored configuration that exactly fits your needs.

Brilliant experience: Zimbabwe Renewable Energy Project

We were contracted by an Independent Power Producer in Zimbabwe, the Riverside Solar Power Station to supply the balance of System (BOS) equipment.

THE CHALLENGE	THE ANSWER	THE ADVANTAGES
To create a solution to simplify onsite construction and commissioning.	An innovative, containerised substation with string inverters and a centralised string inverter solution unique to the industry and boasting minimal cooling power consumption.	• Plug-and-play installation. • Local maintenance. • Cheaper spares holding and security.

Brilliance that will set your project apart.

Proconics was born in operations. That means that we've built the priorities of your operations into the heart of our project model. We place your bottom line at the top of project deliverables.

30% Black woman owned. 51 % Black owned. 100 % Dedicated to brilliance.

We are proudly South African and are excited to align our company with our country's economic strategy as a company that encourages, inspires and empowers our people and communities.

Technical Brilliance. Commercial Transformation.

Our 30-51-100 transformation means that you can also move one step ahead of your competition by maximising on your preferential procurement targets.

We are proud! We celebrate brilliance! We are Proconics!

A word from our MD

We are tremendously excited about our future. Our transformation has added a new dimension to the value we offer our clients. Long term partnerships have always been a cornerstone of our history and are part of our DNA. We can't wait to partner with you, helping you extend the lifespan of your facility, keeping your critical equipment running better, for longer.

Melvin Jones

Proconics

Mechanical, Electrical, Instrumentation and Piping Engineering, EPC Project Management, Renewal Specialists

www.proconics.co.za

PROJECT INTELLIGENCE AS A SERVICE

PMOC™

SOFTWARE APPLICATION

MCORP COMMUNICATIONS

ADDITIONAL SERVICES

CONSULTING SERVICES
PROGRAMME & PROJECT MANAGEMENT
NETWORK INFRASTRUCTURE DEPLOYMENT
OPERATIONS CENTRE SERVICES (NOCDESK)
OPERATIONS INTELLIGENCE AS A SERVICE

BRINGING YOU TOMORROW'S DECISIONS - TODAY!

T I 011 477 5600 I info@mcorp.co.za I www.mcorp.co.za