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THE SMART ISSUE

SAIEE

THE OFFICIAL PUBLICATION OF THE SOUTH AFRICAN INSTITUTE OF ELECTRICAL ENGINEERS | **JANUARY 2015**

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ISSN: 1991-0452

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January is here – a new year with new beginnings. I trust that our members enjoyed a well-deserved festive season and did not overspend on unwanted gifts.

This issue of wattnow is jam-packed with great content. As you have seen already – this is the "Smart issue".

Our first feature article, aptly written by John Dirkman, shares with us the development of a roadmap to a smarter utility. Read this article on page 24.

Jaco Cronjé informs us of the technological barriers to implementing the smart grid in South Africa. This you will find on page 34.

With the New Year, come new resolutions, which we normally break by the 23rd of January. So Lovemore Chilimanzi's empowerment article on page 46 gives us hope in keeping that resolution for a little longer.

WATT? is our new regular feature where we have your industry questions answered by experts. You can send me your questions anonymously (if you prefer) to minx@saiee.org.za. This "Expert Advice" column will only be a success with your participation, so I implore you to send me any questions you might have, which are industry related.

May you all have a prosperous 2015, where we will be instrumental in developing a world class South Africa.

Herewith the January issue - enjoy the read.

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


"Share a little to save a life"
The Sunflower Fund recruits donors to help those suffering from leukaemia and other life-threatening blood disorders.
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Greetings to all our Members from SAIEE House, Johannesburg

Welcome to the New Year. My expectation is a productive 2015. In tough times, it is best to harness all our energy for self study and career development. Keep your expenses low, minimise your footprint on Mother Nature, keep thinking big, and make bold decisions. Be confident, and you will gain strength in your workings, and through your contributions to make yourself and South Africa a world class society.

We closed 2014 by recognising fellow members for their sterling performance. Thank you to Professor Ian Craig, Prudence Madiba, Wayne Fisher, Elyssa Spreeth, Chairs of Sections, Centres, Council Committees and our Administration for all your contributions and achievements. Your individual and collective efforts make us proud.

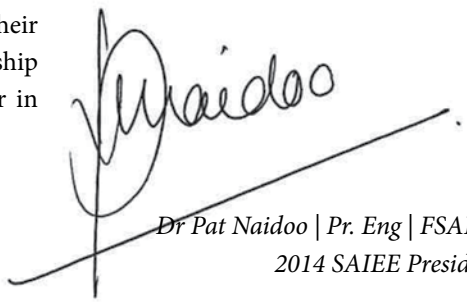
Our final farewell to 2014 occurred at the Nelson Mandela Metropolitan University. Final year graduates assembled and presented their winning papers at the National Student Competition. We were impressed with the quality of the work emanating from our universities. All the students were recognised as winners. The University of Stellenbosch and the Nelson Mandela Metropolitan University received the top honours in their respective categories. Our present from the Eastern Cape Centre was the launch of their student chapter. We were astounded by their presentations and complete ownership of the challenges of being an engineer in training.

In the closing days of 2014, we received a visit from our Honorary Fellow; Dr. Ian McRae. With strength and courage, he provided leadership on South Africa's challenges associated with electrical power supply. Dr. McRae achieved record performance in the management, technology and economics when he delivered Eskom as the world's best. Dr. McRae remains steadfast that we as South Africans have the answers to our present day challenges. Collectively, with intense customer focus, we will make every effort to help Eskom and South Africa to achieve excellence.

South Africa, two decades into democracy, continues to struggle with the engineering infrastructure that is required to deliver a better quality of life to all our people. When compared to the continued struggles across the world, we are fortunate for the collective leadership that delivered us to the present day South Africa. As South Africans, we can all be proud. The lawyers have done their share; it now the turn for the engineers to work hard and strengthen the lagging parts of the country's built environment and engineering infrastructure. Our efforts will deliver delighted citizens and the better quality of life for all our people.

As we gather momentum into 2015, let us continuously provide customer focussed leadership at every opportunity. Together, we will polish up South Africa.

Enjoy 2015. Be confident. Best wishes for a prosperous year. Thank you.



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

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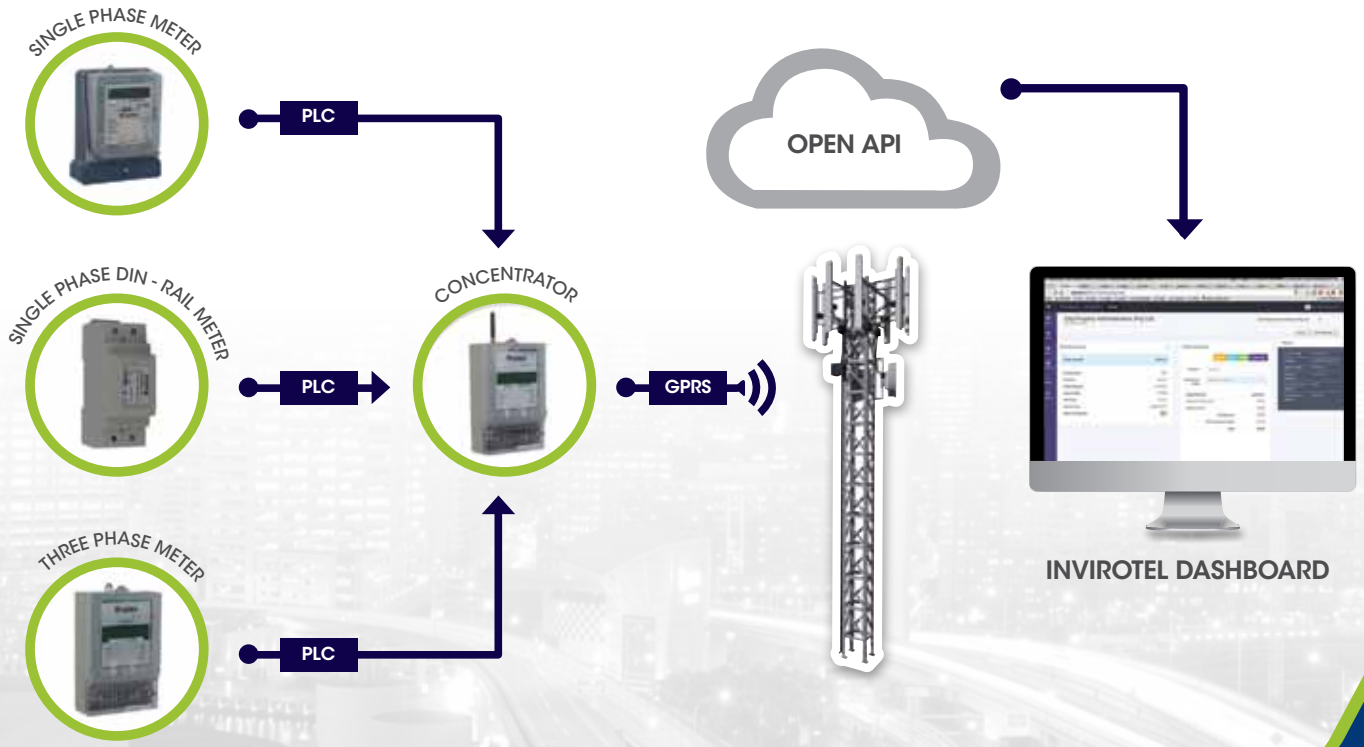

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SAIEE National Student Project Competition

The Annual SAIEE National Student Project Competition took place recently. It was hosted by the Nelson Mandela Metropolitan University (NMMU) in Port Elizabeth.

The quality of projects presented to the judges, was of an extremely high calibre, and all very interesting.

Dr Pat Naidoo, SAIEE President, briefly spoke to all the contestants before the prize giving ceremony. He thanked all the students and their mentors for their participation. *"You are all winners today - your projects were of world class standards - well done"* he said.

Andrew de Bruin from Stellenbosch University took the award in the BSc category, with his project "Drone-based Traffic Flow Estimation".

Nicholas Hoernle from the University of Cape Town, and Tinus van den Heever from North West University, each received a Dicretionary prize from the judges in the BSc category.

The winner in the B-Tech category was Danie Walters from NMMU for his project "Implementation of a software framework for the robotic manipulation of a six-axis parallel kinematic platform".

Noreetha Philander and Alan Vivian each received a discretionary prize from the judges in the B Tech category.

A huge thank you goes out to Lizl Blom from NMMU who assisted with organizing this successful event, as well as to NMMU for their hospitality.

Thank you to all the participating universities and universities of technology, and particularly to Actom, CBI Electric, Zest WEG Group and PPS for their sponsorship.

Dr Pat Naidoo with Danie Walters (NMMU), winner in the B Tech Category

Dr Pat Naidoo with Andrew de Bruin from Stellenbosch University, winner in the B Sc Category

Dr Pat Naidoo with Allan Vivian, discretionary prize winner in B Tech category.

Dr Pat Naidoo with Noreetha Philander, discretionary prize winner in B Tech category.

Dr Pat Naidoo with Nicholas Hoernle (UCT), discretionary prize winner in B Sc category.

Dr Pat Naidoo with Tinus vd Heever (NWU), discretionary prize winner in B Sc category.

All the participating students with Eastern Cape Chairman Dawid Bester (front left), Alan Roberts, HoD NMMU (Back left) and Pat Naidoo, SAIEE President (right front)

Tinus van den Heever and Allan Vivian going crazy!

Serge Mbamba & Mandla Mbuli from Wits

Mauritz van Rooyen and Dr Ben Kotze from Central University.

NMMU Student Chapter launched

The visiting SAIEE Team to NMMU, Pat Naidoo, Stan Bridgens, Gerda Geyer and Minx Avrabos had the pleasure in meeting the newly formed NMMU Student Chapter.

A lively, organized bunch who had us enthralled with their plans for the future are under leadership of the Head of Department, Mr Alan Roberts and the Eastern Cape Centre Chairman, Dawid Bester. Well done team, and good luck!

2014 IITPSA President's Awards

All the Winners - 2014 IITPSA President's Awards
The Institute of Information Technology Professionals South Africa (IITPSA) recently held the IITPSA President's Awards Breakfast at Montecasino.

The following award winners were announced:
IT Personality of the Year - Gian Visser (Afrihost)
Visionary CIO of the Year - Tshifhiwa Ramuthaga (FSB)
Special Recognition - Ahmed "Smiley" Ismael (Siyafunda CTC)
IT Leading Employer - SQS Group Ltd
Distinguished Service in ICT - Mike Chiles
Fellowship of the IITPSA - Jane Buisson-Street
Awards of Appreciation - Prof Basie von Solms & Pieter Waker.

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DEHN protects St Melanie's school

DEHN PROTECTION SOUTH AFRICA recently extended the protection of the young attendees of the St Melanie's Day-care and Pre-school in Pretoria, Gauteng, with the donation of much-needed sunshades for the outside play area, as well as a main gate for the school.

Alexis Barwise, MD of DEHN PROTECTION SOUTH AFRICA, along with Dr. Philipp Dehn, CEO of the DEHNgroup and Bernhard Stadlmann, International Sales Senior Executive at DEHN+SÖHNE, were on hand to assist with the installation of the new equipment as well as to enjoy the playground with the kids.

Says Barwise: *"By assisting St Melanie's with this donation, DEHN has helped ensure that the school's pupils now have access to a much safer outside environment, both in terms of providing a more secure playground as well as protection from the heat of the sun."*

Left: Dr. Philipp Dehn (CEO of the DEHNgroup), Alexis Barwise (MD of DEHN PROTECTION SOUTH AFRICA) and Bernhard Stadlmann (International Sales Senior Executive at DEHN+SÖHNE) with three of the caregivers at the St Melanie's school.

Jeffreys Bay Wind Farm visit

November saw two dozen SAIEE members from the Southern Cape and Eastern Cape converge on Jeffreys Bay to tour the recently completed power generating site, under the guidance of Hannes Bester, Globeteq's Site Manager.

After the compulsory safety briefing and orientation session, members inspected one of the 60 towers, each capable of 2,3MW. The towers are scattered over an extensive area, each fixed on a concrete base of 18m diameter and 3,5m depth.

The three-section steel tower is 80m in height, supporting the generator driven by a three-bladed rotor of 101m diameter. Rotation speed is from 6 to 16 RPM, depending on wind velocity. The blades can also be feathered when not in service, or set at optimum pitch for prevailing conditions. The entire generator pod automatically tracks the wind direction for maximum effect.

The rotor shaft couples through an epicyclic gearbox to the generator, producing 690V "wild" AC. This is rectified, and converter to 690V 50Hz AC, which in turn is transformed to 33kV.

Members were also treated to a visit to the measurement and control area, as well as the 160MVA transformer feeding the 132kV line connecting the Eskom grid.

This was an excellent opportunity to meet with members from the neighbouring Centre, and it is hoped that there will be many more such combined visits in future.

Valeo Innovation Challenge 2015: Just two months to go!

Engineering students around the world have just two months left to take part in the global Valeo Innovation Challenge. Projects must be submitted to the contest's dedicated website by February 2, 2015.

Participants can sign up now at the Valeo Innovation Challenge website.

Just over a month ago, Valeo presented a €100,000 check to the winning team of the first Valeo Innovation Challenge. The second edition of the worldwide contest was announced at the end of the presentation ceremony.

Contest participants are asked to develop bold, revolutionary solutions to design equipment that, between now and 2030, will make cars more intelligent and intuitive.

To date, more than 113 teams from 33 countries have signed up for the second Valeo Innovation Challenge.

Students have until February 2, 2015 to submit their projects to the contest's dedicated website. The 20 teams shortlisted by Valeo for outstanding creativity, boldness and originality will be granted €5,000 to create a functioning prototype. The six teams that submit the most innovative projects will be chosen on September 1, 2015 to present their project to a jury chaired by Jacques Aschenbroich, Valeo Chief Executive Officer, and comprised of members of the Group's senior management team, as well as eminent figures from the worlds of science and design. The jury will designate the winning team, which will receive €100,000, with the second and third-place teams each receiving €10,000.

With this second Innovation Challenge, Valeo is demonstrating once again that innovation and R&D are top priorities for the Group. Indeed, innovation guides the teams who are working each day to invent the automobiles of tomorrow.

For more information, go to: https://valeoinnovationchallenge.valeo.com/

Schneider Electric launches Go Green in the City 2015, the 5th edition of its international challenge for students

Schneider Electric, the global specialist in energy management, launched on November 15, the fifth edition of Go Green in the City, a global business case challenge focusing on innovative energy solutions for smart cities.

From November 15th 2014, to February 1st 2015, business and engineering bachelor, master or MBA students from all over the world are welcome to join the challenge. In teams of two, with at least one woman, they will have to submit a case study illustrating their ideas for innovative energy management solutions for one of the five basic urban sectors: residential, university, business, water and hospitals. In the 2014 edition, the team from Hong Kong University won the challenge for its idea, EnerBy, a mobile application that helps users to analyze and manage domestic energy consumption .

In addition to completing the case challenge, participants can expand their Go Green in the City experience by engaging in gamified elements and discovering resources that provide useful insight into developing winning business case solutions. Keeping in tradition with last years' process, participants can also compete with quiz scores and social media votes for the Go Green Champs Award and Social Media Award respectively and win the opportunity to interact with Schneider Electric employees and previous year winners.

Over the last four years, the topic of energy management in smart cities has received increasing attention from students around the world. Attracting more than 12,000 registered participants from 159 countries during last year's edition, Go Green in the City aims to educate young generations and build awareness about the need for smart energy management for sustainable cities. 1,800+ pre-registered participants from over 80 countries have already shown their interest to participate in 2015's challenge.

"This increasing participation in the challenge confirmed the strong involvement and interest of young students to find global solutions and face the current energy challenge," said Olivier Blum, Chief Human Resources Officer, Schneider Electric. "We are proud with Go Green in the City to enable the young workforce to generate new ideas and solutions that will make our cities more sustainable."

The top 100 teams will be announced on February 1st 2015 and will have a month to work with a mentor from Schneider Electric, in order to create a synopsis and a video presentation of their idea. The 12 best teams will then be flown to Paris (France) from June 22nd to 25th, 2014 to compete in the final. The winning team will travel the world, VIP-style, with Schneider Electric, visiting facilities, networking with employees and high-level management. They will also be offered jobs with Schneider Electric in their home countries.

For more information, please visit Go Green in the City website, and follow the challenge on the Facebook and Twitter pages.

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ACTOM MV Switchgear successfully tests new AMV12 range for 31,5 kA/1 sec internal arc classification

Among the goals ACTOM MV Switchgear set out to achieve in developing its new AMV12 range of air-insulated switchgear was to attain an internal arc classification (IAC) of AFLR 31,5 kA for 1 second – proving that their new switchgear meets the highest standards for safety currently available.

The attainment of this important goal was confirmed in September 2014 when the AMV12 range, with ratings of 800 A, 1250 A and 2500 A, was successfully type tested for IAC AFLR 31,5 kA/1 sec at the world-class KEMA type test facility in Arnhem, Holland.

"This is the first switchgear product we have developed that achieves the 31,5 kA/1 sec internal arc classification. It is especially important among the various type tests that have been successfully conducted on the new range as it opens up vital new business opportunities for us that we have not had access to previously," said Rhett Kelly, ACTOM MV Switchgear's Technology Development Specialist. *"We are now ready to launch the new range into the market, which is planned for early in the new year,"* Kelly remarked.

This picture shows the 31,5 kA/1 sec IAC type test on ACTOM MV Switchgear's new AMV12 switchgear in progress at the KEMA test facility in Holland in September 2014.

Kibo Mining appoints Aurecon for power plant study in Tanzania

Kibo Mining has appointed Aurecon to conduct a prefeasibility study for a 300MW coal fired power plant in Rukwa, Tanzania.

CEO of Kibo Mining Louis Coetzee said: *"We are exceptionally pleased with the acceleration of this study and the appointment of Aurecon. Following their appointment Aurecon undertook a review of historically gathered information and the comprehensive nature of the data available enabled them to commit to delivery of the full prefeasibility study in early December 2014."*

Aurecon Power Generation Leader Ashley Grohn said that the decision by Kibo Mining to proceed with prefeasibility is another example of private sector enthusiasm for the establishment of power infrastructure in Africa, as we see a growing number of Independent Power Producers (IPPs) embarking on new developments in the continent.

"The coal reserves are extensive to the point that alternate energy conversion technologies could be entertained by Kibo in the future," Ashley said.

In undertaking the Rukwa power plant prefeasibility study, Aurecon will assess and test the various available power plant technologies for performance and feasibility, including boiler technology and cooling system design.

Ashley said that the study provides Aurecon with another exciting opportunity to leverage its global strength and knowledge in power project development into Africa.

"Aurecon is proud to be associated with this project as we perceive the socio-economic benefits for the south-west region and for Tanzania to be substantial both during construction and operation of the project," Ashley said.

Aurecon's capability to provide end-to-end 'turnkey' services including environmental, power plant technology appraisal and power evacuation modelling, combined with its track record with mining houses in Sub-Saharan Africa on similar projects, were key factors in the company's appointment. Aurecon will assist Kibo Mining with the next steps to enter full feasibility at the start of 2015.

Zest WEG Group donates electric equipment to assist Nkangala FET colleges

Skills shortages remain an issue for the country. The Zest WEG Group recently assisted three colleges within the Nkangala Further Education and Training (FET) College scheme with the donation of electric motors, switchgears, soft starters and other electric equipment.

Nokuthula Shabangu, the company's CSI project manager, explains that the Nkangala FET College scheme was formed in 2003 with the merger of the Witbank, Middelburg, Mpondozankomo and CN Mahlangu campuses (formerly technical colleges) in the Nkangala region. Waterval-Boven campus was transferred in 2011 from Ehlanzeni FET College and the Nkangala Further Education and Training College was formed after the adoption of the FET Act of 1996 by Parliament.

"The College is the largest educational institution in the Mpumalanga province, serving the community in the Nkangala region. The majority of the learners are drawn primarily from the densely populated urban areas of Witbank and Middelburg. The remainder of the students hail from the rural areas of the former Kwa-Ndebele and Waterval-Boven. In 2007, 719 students were enrolled in NC(V) programmes and 11 917 students in Nated 191 courses. More than 95% of the students come from the previously disadvantaged groups," she said.

The College offers eight NC(V) programmes, namely civil engineering and building construction, electrical infrastructure construction, engineering and related design, finance, economics and accounting, hospitality, tourism, information technology and computer science as well as office administration.

"The donation of Zest WEG Group products to the scheme will provide learners with critical access to current technology. Once they enter the workplace, after successful completion of their respective courses, they will be equipped to handle all the equipment we have provided," Shabangu concludes.

(From left) Kevin Venketroyalu, senior supervisor, Commercial & Shipping, Zest WEG Group; Brandon MacDonald, stock clerk, Commercial & Shipping, Zest WEG Group; Nokuthula Shabangu, compensation specialist, human resources, Zest WEG Group; Sicelo Gumede, senior lecturer: engineering studies, Pretoria Technical College and Muano Magoro, Head of Department: Engineering Studies, Pretoria Technical College.

International Certified energy professionals recognised

Certified Energy Managers (CEMs) receiving their international certification at the Energy Training Foundation's (EnTF's) Association of Energy Engineers' (AEE) Certification Ceremony held in November 2014 at Emperors Palace in Johannesburg.

At the Energy Training Foundation's (EnTF) annual Association of Energy Engineers (AEE) Certification Ceremony held in November 2014, another group of energy professionals received international recognition in the energy efficiency fraternity.

South Africa boasts with 530 Certified Professionals in the Certified Energy Manager (CEM), Certified Measurement and Verification Professional (CMVP), Certified Energy Auditor (CEA), Certified Carbon Reduction Manager (CRM) and Certified Renewable Energy Professional (REP) out of 28,000 in the world. *"As a country we have taken on the responsibility to move forward through education ourselves and becoming Certified, especially in CMVP as 6% of the total Certified professionals in the world is from South Africa"*, said Prof LJ Grobler, Dean of NWU Engineering Department and Immediate Past President of the SAEE.

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KZN Centre Dinner and Awards Ceremony

Veer & Sharona Ramnarain with Past President Bob & Nora Hayes

Veer & Sharona Ramnarain, Dr Pat & Maureen Naidoo and Professor & Mrs Afullo (UKZN)

Veer Ramnarain, Andiswa Biyase & Dr Haines

Veer Ramnarain & Kevin Moorgas (DUT)

Veer Ramnarain & Cyril Rutters (MUT)

Veer Ramnarain, Prof Afullo, Moganum Govender & Hansadevi Sewnarain

Veer Ramnarain, Gerhard Groenewald & Sinothi Sibisi

Feni Adebanji & Veer Ramnarain

November 2014 saw the KZN Centre hosting their bi-annual Dinner and Awards ceremony at the Durban Country Club. The event, which was hosted by Chairman Veer Ramnarain and Vice Chairman Vincent Tiedt, was attended by +/- 190 people including various past Chairmen, past President Bob Hayes and current President Dr Pat Naidoo. Guest Speaker Femi Adebanji kept the crowd entertained with his insightful talk on "Business Unusual - Successfully Creating a Culture of Innovation". The highlight of the evening was the presentation of awards. The following awards were presented:

- Best 3rd Year Electrical Design Project Award to Moganum Govender studying at University of Kwa-Zulu Natal
- Best Final Year Student in Power Systems Award to Hansadevi Sewnarain studying at University of Kwa-Zulu Natal
- Best Engineering Learner at Ixopo High School presented to Andiswa Biyase
- Young Achiever Award (co-sponsored by Schneider Electric) to Sinothi Sibisi of eThekwini Electricity
- Significant Project Award (co-sponsored by Schneider Electric) to Dayalen (Des) Naidoo of DNA Consulting Engineers
- Lifetime Contribution Award to Chris Ramble

The evening was a huge success with guests networking until late in the evening. Veer thanked everyone for their support over the years since the establishment of the SAIEE KZN Centre in 1957.

UJ awards Co-ordinator with Vice-Chancellor's Distinguished Award

Faculty of Engineering and the Built Environment (FEBE) Relationship Co-ordinator, Lucia Pelser has been announced as the recipient of the Distinguished Award: Outstanding Service Beyond the Call at University of Johannesburg's (UJ) prestigious Vice-Chancellors Awards Ceremony. The event, held at UJ Council Chambers at Auckland Park Kingsway Campus on 13 November, focused on encouraging and acknowledging research excellence, innovation, outstanding performance in teaching, learning, social responsiveness through community engagement and transformation through work commitment. Pelser, 45, celebrated her achievement with three rated NRF researchers from the Faculty.

FEBE Executive Dean, Professor Saurabh Sinha said: *"It is with great appreciation that we honour the work of Relationship Co-ordinator, Lucia Pelser, for her exemplary work ethic, commitment and contribution to the development of engineering and the built environment graduates. Pelser has fostered academic development through bursary, tuition and accommodation support and has established strong links with industry stakeholders that have facilitated the development of our students.*

"It is with great pride that we celebrate her achievement, she is indeed an outstanding individual who has overcome several personal adversities. Despite personal tragedies, she has gone beyond the call of duty, continues to persevere, creating new benchmarks and making a significant impact. As FEBE Executive Dean, I am honoured that the Faculty employs staff with a passion for what they do and it is the drive of individuals like Pelser that builds capacity in developing people orientated environment that fosters academic excellence, research and innovation."

Lucia Pelser, recipient of the Distinguished Award: Outstanding Service Beyond the Call at University of Johannesburg (UJ)

SAIEE Western Cape Centre Student Paper Evening

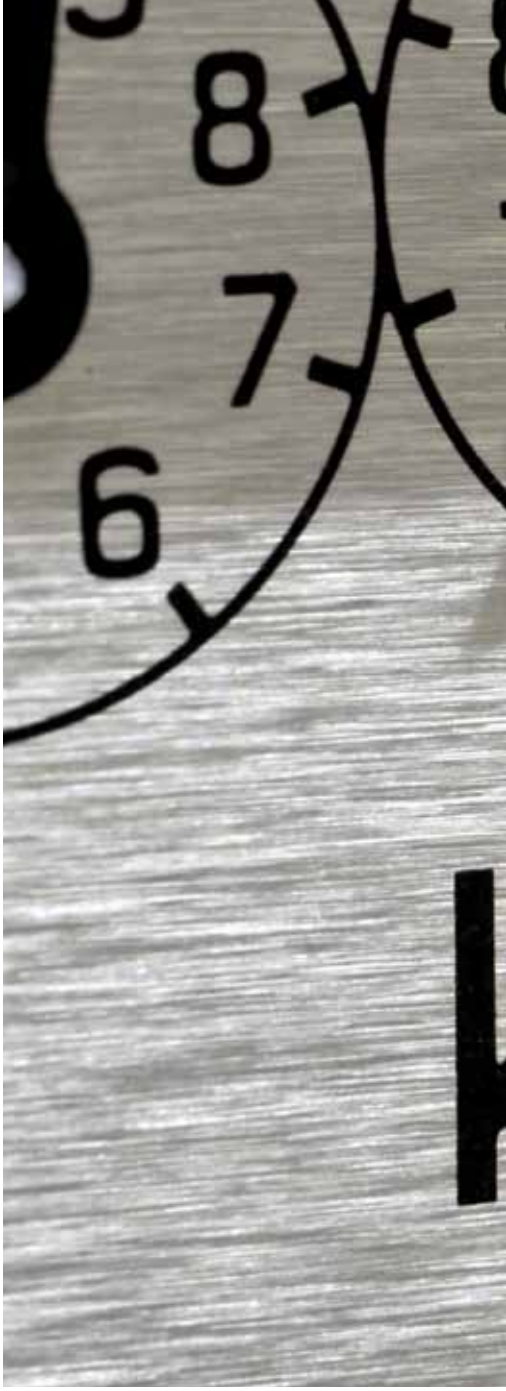
From Left: Sello Raphadu (SAIEE WCC Secretary), Rogerió Delgado Gunza (2nd Prize Winner), Anna-Marie Du Plooy (1st Prize Winner), Jonathan Brown (3rd Prize Winner) and Phumelelo Ngxonono (SAIEE WCC Chairman)

Every year, final year students of electrical, electronic and computer engineering at South African academic universities and universities of technology are required to complete an intensive design project. The best student project nominated by these educational institutes competes against ±15 other presentations in the SAIEE National Student Project Competition, and prizes are awarded to the adjudicated winners.

The Western Cape Centre of the Institute, as one of the very active Centres in the country, hosts a similar event as a precursor to the national competition for the local Higher Education Institutions in the Western Cape. Each year, the event boasts stiff local competition between University of Cape Town (UCT), Stellenbosch University (US) and Cape Peninsula University of Technology (CPUT).

The 3 Universities take turn each year to host the event. This year's Local Student Paper evening was hosted by UCT. It was a well organised evening with the assistance of Prof Paul Barendse and Ms Janine Buxey amongst the number of UCT Staff that landed a hand to the success of the event. A big thank you goes out to Horne Technologies for sponsoring R3000 towards the prize money.

The smart electrical future



Recent developments in 2014 (load shedding in March and again in October) have clearly illustrated the dwindling capacity of the large state owned utility (ESKOM) to meet the needs of a country, desperately in need of secure, affordable energy.

BY I PROF WILLIE CRONJE I PR.ENG I FSAIEE

After the latest incident at Majuba (collapse of a coal storage silo), the availability of the Eskom fleet has sunk to new lows, not spelling out great visions for 2015. That the engineers and managers managed to get the county through the winter of 2014 without load shedding, and a reserve margin that is frequently close to zero, deserves special praise.

Reflecting on the short, medium and long-term electricity supply future in South Africa, makes it clear that the centralized generation model, as currently executed in South Africa, is possibly not sustainable. The humbling experience of the delays generated in the latest mega generation projects, should illustrate that mega-sized, centralized solutions are overrated. Serious changes to policy and operation will be required fairly soon, if the slide towards de-industrialization is to be slowed, and eventually reversed. The impact on ordinary people, and small businesses, can be devastating if this situation persists.

In the light of the above, it is can be seen that supply security will be under threat for the near to middle term future. Supply sensitive industries will need to become resilient through implementing measures that will insure anything from complete independence, to interruption-free operation of critical sub-systems. Several technological options are available to companies and organizations wishing to become more resilient in the face of electrical supply insecurity. Microgrids represent such a possible solution. This is where distributed generation sources can be connected into a local grid which is able to function autonomously in the absence of the utility grid. This is becoming an increasingly realistic situation for the South African context. In remote rural regions of South Africa, and the rest of the continent, the same technology can be applied to establish and operate completely autonomous Microgrids.

Microgrids are already deployed in certain situations. These normally require sophisticated communication and control systems, which limit their application to situations where the

required costs and engineering human resources can be justified. Building on the success of the ICT revolution of the preceding decades, intelligence (storage, processing and communication) can be incorporated into Microgrid nodes to bring this vision to reality. It would seem that completely autonomous nodes could fulfill the role of making this vision a reality. The required intelligence can be incorporated during manufacturing, so as to relieve the end-user/owner of this burden. This can open the door to implementing plug-and-play style Microgrids with low commissioning overhead, that will bring down the system capital and operational costs. Such a modular and scalable approach will allow easy extension, and simplify ongoing system changes that will in turn save costs. This will also make Microgrids more accessible for small and middle sized operations that don't have huge financial resources to access the engineering skills, and the manpower required, every time a change or upgrade to the microgrid is required.

Perhaps intelligent Microgrids will be the true smart-grid of the future? It is perhaps fitting that SAUPEC2015 is focusing on Smartgrid concepts that can contribute to progress into the right direction. Visit SAUPEC 2015 at The University of Johannesburg from 28 – 30 January 2015. For more info, visit www.saupec.org.za wn

SAUPEC
Southern African Universities Power Engineering Conference

Year of Africa to kick off at the 2015 Africa Energy Indaba

The World Energy Council has designated 2015 as its "Year of Africa" and will kick start its year-long programme at the 2015 Africa Energy Indaba conference, scheduled to take place from February 17 to 18, 2015 at the Sandton Convention Centre in Johannesburg, South Africa.

The Africa Energy Indaba, adopted by the World Energy Council as its Africa regional event since 2011, receives global recognition as a leading event, attended by energy professionals and decision-makers from across the continent and the globe.

The Council has focused this year on the continent's pressing energy issues by bringing together international ministers and business leaders to dialogue and find sustainable solutions to eradicate Africa's energy poverty crisis and build on the opportunities provided by its vast energy resources.

"This is the opportunity for Africans to tell the African story, to challenge and clarify misconceptions about the continent," says Brian Statham, steering committee chair of the Africa Energy Indaba. *"People who don't know Africa have often only heard bad news and that is the only story they have and remember about the continent. This is an opportunity for us to showcase the many positive things happening; the opportunity to change people's ideas about Africa,"* adds Statham.

According to the latest results released by a comprehensive study published by the International Energy Agency (IEA) in November 2014, less than 620 million sub-Saharan Africans have access to electricity. According to the same IEA study, although energy demand in sub-Saharan Africa grew by 45% between 2000 and 2012, the continent accounts for only 4% of the global energy demand despite being home to 13% of the global population.

Meanwhile, not enough is being done to get Africa to universal energy access in the next few decades. The World Energy Council's Scenarios study sees that, on current paths, between 266 million and 402 million sub-Saharan Africans could still be without access to electricity by 2050.

In the face of these rampant challenges opportunities do exist on the continent, that has the capabilities of accelerating the process of improving energy access, so that energy becomes a driver of the region's social and economic development. According to the IEA report, the problem is not that the region lacks energy resources. Resources are more than sufficient to meet the needs of the continent's population, but Africa is largely under-developed.

"Africa must first reduce its political risk through improving its energy trilemma balance in order to attract investment," says Christoph Frei, Secretary General of the World Energy Council. *"It must advance regional integration and unlock huge untapped potential in hydropower, new renewables and natural gas while delivering on the energy access agenda.*

For South Africa, it must look into how it can utilise its unconventional gas resources in order to move away from dependence on coal and diversify the energy mix. The Africa Energy Indaba will therefore provide a well-established and much-needed platform for policymakers and business leaders to share best practices and fast-track progress on these issues," adds Frei.

The World Energy Council will culminate its string of events and research focused around its Year of Africa at its 2015 Executive Assembly in Addis Ababa, Ethiopia in October 24-30, 2015. wn

2015: WORLD ENERGY COUNCIL YEAR OF AFRICA

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Integration, sustainability top Africa's power agenda

POWER-GEN 2015's expert advisory board has identified integration of renewable energy into the traditional power ecosystem, universal access to power, and funding and sustainability as key issues to address at Africa's premier power sector event.

The integration of renewable energy into the traditional power ecosystem, universal access to power and funding and sustainability issues are among the top challenges facing sub-Saharan Africa's power generation sector in the short term.

This emerged during a meeting of an expert Advisory Board to assess the most crucial issues facing Africa's power sector, which will come under discussion at POWER-GEN Africa 2015 in Cape Town in July 2015.

The Advisory Board includes academics, industry body representatives and experts from a number of African countries, with organisations such as the National Energy Regulator of South Africa (NERSA), the Southern African Alternative Energy Association (SAAEA), Eskom, Renewable Energy and Energy Efficiency Partnership (REEEP), the Lesotho Highlands Water Commission and CEFA Tanzania among its members.

Nigel Blackaby, POWER-GEN Africa Event Director & Conference Director for PennWell's International Power Group, said across Africa, regulators and utilities were facing similar challenges in terms of sustainability and service delivery. In addition, many were tasked with an integrated power generation and distribution function, which had prompted PennWell to co-locate POWER-GEN Africa with DistribuTECH Africa, to allow the growing numbers of pan-African delegates to attend both events and so make efficient use of their time.

The Advisory Board, which also assessed abstracts submitted ahead of the conference, noted that a number of key themes were coming to the fore in the African power generation sector. One such theme was funding and investment, they said. With Africa seen as potentially the next big market for independent power producers, questions are arising around regulation, best practice and funding models. In some regions, a cost versus

standards debate was emerging as foreign developers entered the African market, they noted.

Renewable energy, which is now seeing strong uptake as the cost of generation drops, is also emerging as a top strategic issue as questions arise around the regulatory environment, integration models and pricing structures, the Board noted. Investors are increasingly looking to projects in Africa, such as the recently-opened 96 megawatt (MW) photovoltaic (PV) Jasper Solar Plant near Kimberley, developed by a consortium including Google, and the 160 MW Nour 1 thermo-solar plant set to go live in Morocco next year.

Meeting growing power demand through strategies such as the liberalisation of markets, government grants and international development initiatives; as well as new models for controlling the cost of power generation were also important issues the sector is facing.

Other themes impacting the sector now include the interconnection of regional grids and progress towards regional power pools, centralised versus distributed generation models and capacity building in the sector.

The Advisory Board will select papers addressing these and other key issues for presentation at POWER-GEN Africa 2015, where up to 3,000 global thought leaders and stakeholders will convene from 15-17 July 2015 at the Cape Town International Convention Centre, Cape Town, South Africa, under the theme 'Emerging Opportunities in the World's Fastest Growing Continent'.

The event, to be hosted by PennWell Corporation, will attract a broad range of delegates, including regional electricity distribution companies, power producers, utilities, oil and gas companies, energy and engineering consultants, government and regulators, environmental agencies, development agencies and investors.

For further information, and to register for the conference visit www.powergenafrica.com wn

WINDABA 2014

The South African Wind Energy Association (SAWEA) in association with the Global Wind Energy Council (GWEC) hosted the 4th annual conference in Cape Town recently with the theme: "Power 2 the People".

BY I ATTILIO DALVIT I MSC ITM, UK I SMSAIEE

The conference's main focus was on the Policies from the Government, NERSA, IDC and ESKOM, and Socio-economic issues towards communities in South Africa.

In conjunction with the various sponsors, namely GOLDWIND, NORDEN, SIEMENS and VESTAS and many others, some focus was placed also on Technical, Financial, Environmental and Educational aspects of the programme.

On the technical side various items were discussed including: Construction, Cost of the structures, Educational and Operations &Maintenance (O&M) of the wind farms in South Africa and around the world as a comparison.

Financial issues were tabled and discussed regarding Renewable Energy Independent Power Procurement Program (REIPPP), Investments, Energy costs etc.. even ESKOM tried to shed some light on some decisions taken regarding grid connectivity, access to the grid and all the technical controlling factors.

Education and training for engineers and technicians was also discussed. SARETEC (South African Renewable Energy Technology Centre) developed several courses for the Wind Power (Turbine) technology in conjunction with the Cape Peninsula Technology University in Bellville (Cape Town).

On the Government side, the conference stated that there should be a better structure over the working permits. The time factor for the investment was also discussed and slides were shown on the Development, Planning, Engineering, Procurement, Construction and Installation.

A brief introduction over rural electrification was given, using an integration of Wind and PV power.

According to the Honourable Mr Morgens Jensen, Danish Minister of Trade and Development, South Africa could become the hub and a leader of wind energy as it is now one of the most attractive countries for wind and renewable energy in the Sub-Saharan region.

As an example the Danish government set up a target of reaching 35% of the utilization in Wind energy. Naturally the European Union is not 'an island', as South Africa was referred to be by Eskom. In Europe there is constant exchange of energy between counties. If there is no wind in Denmark, they can have energy from solar power from Spain, Germany or France and vice versa.

If there is intelligent integration of renewable of energy between Wind, Solar and, for the time being, from Coal, Gas and Nuclear, we shall overcome the resistance of Eskom with regards to the renewable energy issue.

We need to know where we are now, if we need to know where we are going! The National Utility generator, Eskom, according to SAWEA, has been supported by the National Treasury to an approximate value of R350 billion. Eskom's cash flow shows another shortfall of R200 billion for the next few years.

We are under the Damocles' sword with regard to power cuts and constant increases of tariffs. Medupi has become a project management disaster. The mighty power generation suppler is, instead of being "On Time", years behind schedule and instead of being "On Budget" is R50 to R100 billion over budget!

The Wind Conference endorsed and encouraged us to look into renewable sources of energy. The following reasons were given by speakers:

Wind: One 3 MW wind turbine requires between 14 to 21 days to install and be connected to the national grid, so if you are installing 30 MW you need more or less 6 months to do so.

Photovoltaic: A 75 MW installation on a fixed structure requires approximately between 8 to 10 months to be connected to the grid.

In South Africa we are blessed in many ways: We have wind all around the east and the west coastlines and as far as sunshine is concerned, we have one of the best irradiance in the world. In the Karoo it reaches over 1000 W/m² on peak hours compared to the 600 W/m² of Northern Europe.

Let's see some statistical numbers from www.gwec.net:

5500	The average number of European households powered from a 6 MW offshore wind turbine;
25	The price in US Dollars that the wind energy producer is selling for, per MW/h in the U.S., is down from the $70 where it was before;
55%	Of all energy usage in Southern Australia on the 5th of September 2012 was generated by wind energy;
15000	New jobs created by the Wind industry in Brazil;
3	It takes from 3 to 6 months for a wind turbine to recoup the energy used in its production;
15	The average rotation of the wind turbine per minute;
5,700,000,000	Europe exported 5,7 billion Euros worth of wind products in 2011 (Should South Africa not be producing it for the Sub-Saharan Africa?); and
1,5	One and a half years to build 1000 MW of Wind Power.

According to all the manufactures in the wind industry it is common knowledge that wind power is still in its infancy. Therefore there are plenty of opportunities to create a sustainable industry in South Africa. Together with the skills development, technological innovations, and proper structure we could even export wind products throughout the southern hemisphere.

Just as the computer industry developed in the last 40 years, so the renewable energy and the wind industry in particular, could reach maturity within 20 to 25 years, increasing its efficiency, size and output.

Wind power is produced when there is wind flowing, just as solar power is produced when the sun is shining, usually around the middle of the day. However, the power consumption in a residential area is high early in the morning and in the late afternoon / evening, therefore we should also concentrate and focus on the conservation and on the storage of such energy.

A huge market opportunity arises in the area of the O&M as the warranty period is from 2 to 5 years and thereafter there is the need to maintain, fix turbines, gearboxes, generators and rotors and all the 8000 parts that a wind turbine has.

SARETEC is busy developing the required basic training for technicians and engineers to be able to maintain, adjust, diagnose, repair any aspect of the mechanical and electrical components of the wind turbine. For more information: www.saretec.co.za

Finally, what is the best solution with respect to energy in South Africa?
Nuclear? The Eskom-stated model does not take into consideration the progressive technological advancement of the renewable energy.

Fracking? In the Karoo? This area is already semi desert. Drilling and using massive amounts of water from its aquifer water table would deplete and destroy the natural environment and scarce resources. Blasting and releasing tons of methane to the atmosphere is not an option.

Coal? It will take another 2 years before the first turbine gets into action at Medupi, and for the rest, another few years and again how long will the coal last?

So, let's concentrate on renewables. The emphasis for now is on wind and solar energy and in the future on different other technologies. Photovoltaic efficiency has increased commercially from 7% of thin film to 11% on the same product in the last two years. Monochristalline from 14% to 21% during the same period, and lately in the laboratory it has reached 43%.

Wind turbines have halved the weight of the nacelles and increased their efficiency to 25% . wn

Developing a Roadmap to a Smarter Utility

The regulatory and operational landscape of Smart Grid technologies is highly complex. Conducting thorough research-based strategic planning is essential. Each utility must map its journey to becoming a Smart Utility based on its own unique business drivers and technology needs. This paper presents a proven five-step methodology for developing a cost-effective roadmap for achieving Smart Grid capabilities and maximizing their benefits.

BY | JOHN DIRKMAN
P.E. | SENIOR PRODUCT MANAGER | SCHNEIDER ELECTRIC

Planning for grid transformation is critical. Virtually every utility in the world has requirements and aspirations that could be delivered through the Smart Grid. Some companies have extensive internal teams and consultants mapping out strategy, while many others are struggling to find the right place to start. The complexities of the regulatory environment, existing network operational context, and the adoption of emerging technologies can vary widely from one utility to the next, making the establishment of priorities and action plans anything but simple.

No matter where a utility finds itself on the Smart Grid planning continuum, the reality is the same: developing a Smart Grid roadmap in the midst of this complex and evolving environment is daunting. There is a lot at stake — the potential investments in and benefits from a Smarter Grid are huge. Aligning expenditures with the most critical business drivers in the environment is crucial. In order to ensure that investments are focused where they can do the most good, utilities

KEY BUSINESS DRIVERS FOR SMART GRID INVESTMENT
Regulatory environment
System capacity, expense, and reliability
Generation resources
Media and customer involvement

Table 1
Determining what's driving the need for Smart Grid investment is a crucial first step.

must assess where they are — a starting point, in essence — along the complex continuum of building a Smarter Grid.

This paper discusses the main business drivers for Smart Grid investment and the technologies that the Smart Grid requires. Finally, a five-step plan for building a Smart Grid roadmap is presented. This methodology has proven to be effective in generating support and "buy-

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in" from all critical internal and external stakeholders.

REGULATORY ENVIRONMENT

Both U.S. and international utilities are heavily influenced by multiple regulatory agencies. In the United States, utilities are influenced by agencies on both state and national levels. At the state level, utilities must assess their compliance with changing requirements for reliability, renewable portfolio size, and time-of-use or critical-peak pricing. At the national level, various administrations have created grants, acts, and initiatives to promote and stimulate clean energy, energy efficiency, research, energy independence, and security. In addition, there are multiple national and international agencies that have published cyber security standards and recommendations. All utilities — no matter where on the continuum they are with regard to the age and reliability of their infrastructure and accessible capital for improvements — are required to comply with applicable standards, and noncompliance may result in fines. Utilities must assess their status with regard to regulatory compliance to ensure that Smart Grid improvements satisfy and do not jeopardize or delay compliance with applicable state, national, or international standards.

SYSTEM CAPACITY, EXPENSE, AND RELIABILITY

A look at past, current, and planned future transmission and distribution system capacity, operating expense, and reliability can help determine what is needed to meet standards and growth requirements and lay the foundation for a Smart Utility. It is no secret that electric power networks in many nations are deteriorating, unreliable, and costly to operate and maintain. Demand may be increasing, but available funding options are limited. A close review of the utility's existing grid's strengths and weaknesses, in light of load growth and renewable penetration projections, can bring the general problem into more specific focus. And an honest assessment here helps prioritize next steps according to the utility's short- and long-term financial capacity.

GENERATION RESOURCES

Growing peak demand already has utilities evaluating and deploying alternative energy sources. As utilities assess their current generation capacity and options for expansion (including smaller distributed generation sources), they also need to consider consumers' and regulators' priorities. Conservation and advocacy groups, consumers, and shareholders are calling for and in some cases installing environmentally friendly alternative energy sources, while regulators seek to reduce consumption and carbon emissions through energy efficiency, reneables, and demand response. Assessing generation resources through this lens helps avert reactive and often costly measures once the utility's current capacity limit has been reached.

MEDIA AND CUSTOMER INVOLVEMENT

As much as one might like to execute such honest (and often humbling) assessments in a vacuum, it would be naïve to underestimate the scrutiny with which the government, media, and consumers are continuously evaluating utilities' actions. Residential, commercial, and industrial consumers have come to depend and insist upon highly available, consistent, low-cost electrical energy for all loads, not only those deemed mission critical. Regulatory

REQUIRED SMART GRID TECHNOLOGIES
Wide area networks (WAN), communications and security infrastructure
Advanced metering infrastructure (AMI)
Meter data management (MDM) system
Distribution automation (DA)
Distributed generation, energy storage, electric vehicles,
distributed energy resources, microgrids
Demand response (DR)
Building management systems (BMS) and home area networks (HAN)
Advanced distribution management system (ADMS)
Integration framework and architecture

Table 2
Smart Grid capabilities require various new technologies.

pressure in the form of service level or performance-based rate structures adds to the business drivers for reliable supply. Increased government investment in Smart Grid capabilities also has increased expectations and media interest in how utilities are spending taxpayer dollars. Smart Utilities must be aware of their key audiences' perceptions and expectations in order to better navigate the inevitable obstacles and criticisms along the way to a Smarter Grid.

The roadmap to a Smarter Grid also must include various new technologies that can keep pace with fluctuating demand and the increased need for utility-customer interface and interaction. At its foundation, the Smart Grid requires the following technologies:

WIDE AREA NETWORKS (WAN), COMMUNICATIONS AND SECURITY INFRASTRUCTURE

Linking the large variety of smart devices distributed throughout the network requires secure communications. Each utility that envisions a Smart Grid needs to build a communications network that parallels and can monitor, operate, and optimize the electrical grid. But the technology and drivers that determine the right WAN for each company can vary widely. Should the core infrastructure be internally owned? Or should a public provider be relied upon? Can a single network technology meet the needs of advanced metering infrastructure (AMI) and all the other smart devices in a utility's network? Is there existing infrastructure that can be leveraged, and if so, how? What are the requirements for redundancy and security? These and a myriad of other questions must be addressed to get this core piece of the Smarter Grid right.

ADVANCED METERING INFRASTRUCTURE (AMI)

AMI can enhance meter operations by reducing the cost and improving the accuracy of reading/collecting energy usage information while providing a mechanism to both inform and empower customers as they choose better energy consumption patterns. This is a large topic, but in general a utility needs to look at its current metering status and gain at least a high-level view of the requirements for the future. What are the main areas of concern with the current metering system (manual or automated)? Besides reducing read costs, what are the key drivers? Are there regulatory requirements such as time-of-use or critical-peak pricing rates to be considered? Are there system operating efficiencies to be gained through more/better end point data? What data should the AMI collect: usage, status, voltage, power quality, etc., and with what frequency and accuracy?

METER DATA MANAGEMENT (MDM) SYSTEM

MDM software focuses on properly managing and integrating all meter-generated data: historical data for analysis, as well as billing, power quality, and system events data. This integration tool is the hub that shares data with other critical applications such as customer information systems (CIS)/customer relationship management (CRM) systems, advanced distribution management systems (ADMS), and outage management systems (OMS). Effectively implemented and integrated MDM can provide vendor-neutral solutions allowing the utility to integrate whatever technologies are needed (consumer, industrial and/or multi- utility) into one cohesive system, now and in the future.

DISTRIBUTION AUTOMATION (DA)

Distribution automation (DA) involves devices and secure communications between devices in the distribution network. DA is a broad topic that can be broken down into substation automation (SA) and feeder automation (FA). SA enables electric utilities to remotely monitor, control, and coordinate the distribution components installed in the substation, typically breakers, switches, transformers, and load tap changers using sensors, meters, controllers (often referred to as intelligent electronic devices [IED]), remote terminal units (RTUs) and supervisory control and data acquisition (SCADA) systems. FA extends to circuits beyond the substation fence, and typically includes reclosers, sectionalizers, switches, capacitor banks, voltage regulators, and fault indicators, plus their associated monitoring and control equipment and SCADA systems.

Distribution automation is very beneficial in improving system reliability, safety, and efficiency — especially when used in conjunction with other Smart Grid technologies. Systems like ADMS can help manage and optimize DA and provide guidance on best locations for placing DA devices.

DISTRIBUTED GENERATION, ENERGY STORAGE, ELECTRIC VEHICLES, DISTRIBUTED ENERGY RESOURCES, MICROGRIDS

Of all the Smart Grid technologies, arguably the one emerging the most rapidly with the most profound impact is the growth of distributed generation (DG), energy storage (ES), electric vehicles (EV), distributed energy resources (DER), and microgrids within distribution networks.

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The growth of these technologies within distribution networks presents some major challenges, including reverse power flows, more complex protection schemes, altered voltage profiles, and impacts to system stability. However, they also offer benefits like improving customer reliability, avoiding losses in both transmission and distribution, meeting requirements for reduced emissions, flattening of load profiles, and peak load shaving — operating in this way as virtual power plants.

These new and emerging technologies create a number of questions for utility companies. What are the regulatory drivers? What are the expected growth/penetration rates? Where in the distribution network will these technologies be located? How will they impact the distribution network? How can utilities work with customers to manage, monetize, and optimize these technologies that are changing the transactive energy environment?

DEMAND RESPONSE (DR)

According to the Federal Energy Regulatory Commission, demand response (DR) is defined as "changes in electric usage by end-use customers from their normal consumption patterns in response to changes in the price of electricity over time, or to incentive payments designed to induce lower electricity use at times of high wholesale market prices or when system reliability is jeopardized."

Demand response is a very broad topic that can include other technologies described in this paper such as AMI/MDM systems, distribution automation, energy storage, electric vehicles, distributed energy resources, microgrids, building management systems, home area networks, and advanced distribution management systems. One challenge of demand response is to find ways to minimize the impact on customers as required. It is essential that Smart Utilities consider and plan for demand response and make it part of their Smart Grid roadmap.

BUILDING MANAGEMENT SYSTEMS (BMS) AND HOME AREA NETWORKS (HAN)

A building management system (BMS) is the software, devices, and communications that monitor and control equipment — both electrical and mechanical — in a building, typically larger commercial and industrial buildings for occupant comfort, energy efficiency, and security purposes.

HAN technology is an evolving market and plays an important role in controlling and managing residential power consumption. HAN is characterized as a network contained within a customer's home that connects an individual's digital devices, from multiple computers and their peripheral devices to telephones. Networked devices can include televisions, home security systems, smart appliances, and other digital equipment, as well as larger equipment such as pool pumps, HVAC, water heaters, and appliances (like refrigerators and washing machines) connected to and communicating with smart meters as part of AMI/MDM systems. HAN requirements and opportunities vary at each utility, so a careful assessment is required. Also, HAN technology can also be applied to larger commercial properties as part of the BMS.

Both BMS and HAN can be part of a utility's overall demand response plan. Utilities must determine the growth patterns for these technologies within their distribution networks and work with building owners to determine options for monitoring and control of these systems.

ADVANCED DISTRIBUTION MANAGEMENT SYSTEM (ADMS)

Solutions like ADMS — which combine systems like SCADA for monitoring and control, a distribution management system (DMS) for distribution power applications, outage management system (OMS) for resiliency, energy management system (EMS) for transmission power applications and generation control, and demand-side management (DSM) for managing demand-side resources — communicate directly with AMI/MDM systems, distribution automation (DA), distributed energy resources (DER) and microgrids, demand response, and BMS/HAN controllers.

ADMS supports system analysis, operations, and optimization, providing visualization; situational awareness; and monitoring, forecasting, and control of local generation and load throughout distribution networks. ADMS also allows system operators and engineers to forecast, manage, and mitigate voltage changes, reverse power flows, and more complex protection schemes required by distributed generation (DG), DER, and microgrids. ADMS serves as an analytical engine, managing DA and providing a resource for utilities to coordinate with customers, especially for forecasting peak load and managing demand response. ADMS, when integrated with an accurate weather forecasting system, can provide more reliable load and renewable forecasts, promoting further system optimization. In addition, ADMS enables distributed systems to operate autonomously but coordinates these distributed systems to

optimize overall power flow and economics. Lastly, ADMS can also provide many other supporting applications like volt/VAR optimization; fault location, isolation, and supply restoration (FLISR); reliability analysis; switch management and network reconfiguration; outage management and crew management; load shedding; network planning; optimal device placement; and transmission EMS functions. All in all, ADMS solutions are at the integration point between traditional operations technologies (OT) and information technologies (IT) and are powerful engines for optimizing the Smart Utility.

For further discussion on how a complete, correct and current ADMS real-time model — based on accurate underlying Geographic Information System (GIS) data — enables utilities to implement Smart Grid strategies, see the Schneider Electric white paper Best Practices for Creating Your Smart Grid Network Model.

INTEGRATION FRAMEWORK AND ARCHITECTURE

Each component system of this new technology offers a competitive advantage to the enterprise. Implemented as stand-alone systems, each of these critical technologies would fall short of delivering the maximum business benefit that they could if implemented and integrated together. Putting the Smart Grid components together in an integrated and secure way enables Smart Utility managers and operators to answer some key questions, such as how they can optimize asset use in near-real time, improve customer reliability through better data access, or streamline operations by giving operators a more seamless, simpler user experience with a more comprehensive view of the network. The design of an integrated Smart Grid has to address architecture, including integrating technologies as well as planned and legacy systems. A detailed analysis and design prior to implementation is a must if costly mistakes and premature obsolescence are to be avoided. And, of course, utility stakeholders all realize that more technological integration implies more organizational integration as well. For an industry historically splintered into silos among generation, transmission, distribution, and operational categories, implementing two-way, real-time communication (both internally and externally) is no small task. If for no other reason, most utilities will need a Smart Grid roadmap to navigate the cultural changes necessary to become a fully integrated, communications and customer-centric operation.

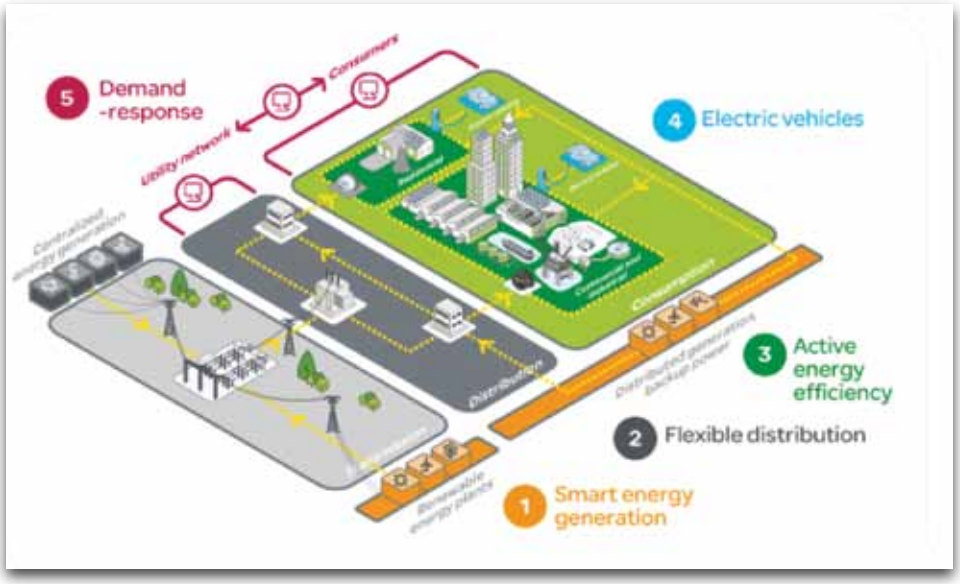

Figure 1
Major components of a Smart Grid that must effectively interoperate

FIVE STEPS TO SMART GRID ROADMAP
1. Define internal roles and responsibilities
2. Conduct workshops to discuss drivers and requirements
3. Define priorities through a business case
4. Document the plan
5. Communicate

Table 3
These five steps have proven to be a cost- effective methodology for developing a Smart Grid roadmap.

FIVE STEPS TO A SMART GRID ROADMAP

After gaining a high-level view of where it stands in terms of regulatory compliance

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and infrastructure and integration capacities, a utility has a starting point from which to map its journey to a Smarter Grid. Schneider Electric's experience has shown that the following five steps not only provide utilities with cost-effective, customized directions for achieving Smart Grid success, it does so in a way that generates support and ownership among critical internal and external audiences.

A brief outline of each step follows. This approach may need to be tailored to a specific situation. A utility may have already done some work in each of these areas, some steps might have to be divided into smaller sections, or the sequence might need to be altered.

STEP #1: DEFINE INTERNAL ROLES AND RESPONSIBILITIES

The first key step is to define the roles and responsibilities of utility management and staff in building the roadmap. Below are seven key roles to be considered:

- Executive sponsor(s) - providing long-term vision and organization resources
- Business leaders - from each affected business area
- Subject matter experts - domain knowledge, as directed by the business leaders
- Project manager or coordinator - to put the effort together
- Regulatory liaison - optional, but potentially important
- Customer liaison - coordinates with customers for DA, BMS/HAN, and DG/ES/EV/DER/microgrid monitoring and control
- Internal advocate/communicator - could be a separate role, or combined with project manager

Working together, this team carries the responsibility to compile the information, express the key business drivers, articulate the priorities, and document and communicate the Smart Grid roadmap.

STEP #2: CONDUCT WORKSHOPS TO DISCUSS DRIVERS AND REQUIREMENTS

Workshops breaking the problem down into its four components — Smart Metering, Smart Networks, Smart Operations, and the central integration, communications, security, and business processes — help utilities identify the critical functionality and integration requirements for a comprehensive electrical network that is smarter and more efficient.

GOAL

The overarching goal of these workshops is to examine the utility's current operating environment and define a roadmap to move the utility further toward the Smart Grid. The information and ideas from the workshops help create a Smart Grid roadmap document that details the steps required to move the utility into the Smart Grid environment, identify the information technology (IT) and operations technology

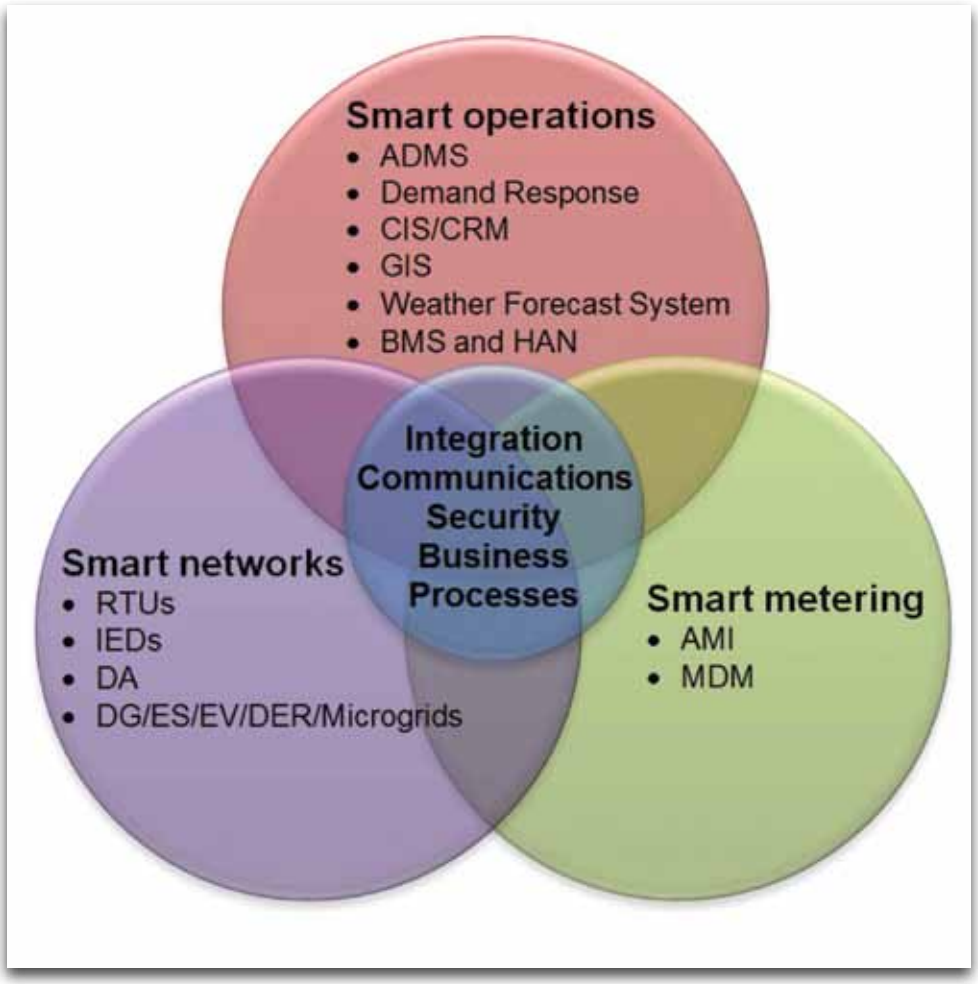


Figure 2
Breaking down the Smart Grid roadmap process into its components helps identify requirements

(OT) systems involved in the effort, discover business process changes affected during the implementation, and recognize benefits to be gained as a result of the implementation.

STRUCTURE

Each workshop begins with an overview of the subject matter to ensure that each participant has a unified view of the topic. The workshop then proceeds with a brief set of questions designed to assess the current state of Smart Grid technology at the utility. After these two background tasks, the next set of questions helps participants brainstorm to discover requirements for Smart Grid implementation. The concluding session for each workshop is a summation of the day's discussion, including the steps necessary to complete the first draft of the roadmap document.

STEP #3: DEFINE PRIORITIES THROUGH A BUSINESS CASE

Once workshops in the four key areas have been completed, it is important to define the priorities for implementing Smart Grid technologies. The key is to build a business case that strikes the best balance between components that the utility needs most and components that can provide quick return. First, assess and validate the business drivers for the Smart Grid investment, such as operational goals and objectives, regulatory requirements, and IT/OT requirements.

Second, estimate the costs for each Smart Grid component or alternative needed: data, hardware/equipment, software, implementation, process, etc. Remember, each cost component has initial and recurring values. For purchased components, be accurate. For estimated components, be conservative.

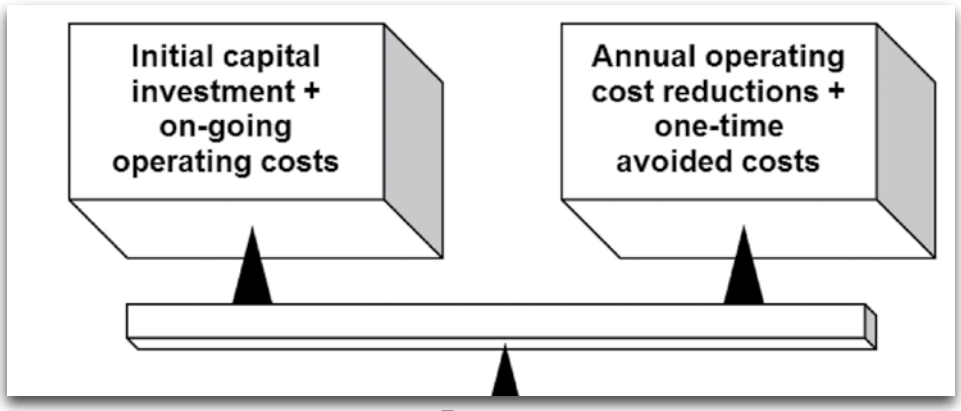


Figure 3
Financial analysis of each Smart Grid alternative compares initial capital investments + ongoing operating costs to annual cost reductions + one-time avoided costs.

Third, based on the workshops, evaluate the business benefits of Smart Grid implementation — those associated with the drivers of operational goals and objectives, regulatory requirements, IT/OT requirements, etc. — and what the utility stands to gain from the Smart Grid components, like reduced capital or operating costs, satisfaction of regulatory requirements, improved revenue, and improved customer service.

Finally, build a financial analysis, remembering that the costs and savings don't occur all at once. Common financial tools used for comparison are net present value, which puts all costs on the same basis (today), accounting for the time value of money; and internal rate of return, which describes the value of an internal investment so that it can be compared to the market.

STEP #4: DOCUMENT THE PLAN

The best way to summarize the onsite workshops and use them to communicate and facilitate implementation is to develop a Smart Grid roadmap document. The roadmap document should summarize the results of the workshops and place the components of the Smart Grid solution into a framework that can be implemented by the utility. Knowing the form and content of that document may be helpful to the team in preparing for the workshops, so an outline of an approach to documenting the roadmap is shown in Table 4.

The utility's master Smart Grid plan should identify the key participants/stakeholders and summarize the findings of the workshop process and business case to provide context. Then, the plan itself should contain a brief description of the business drivers for each project or phase of implementation, including potential pilot projects, summarize the business case for each, and detail the execution plan, including which stakeholders it will impact and how and when.

STEP #5: COMMUNICATE

While communication certainly is not the last step in the "roadmap to success," its importance to successful Smart Grid implementation cannot be overemphasized. From the beginning, communication has to be organization-wide, which in

Smarter Utility

continues from page 31

SAMPLE ROADMAP OUTLINE
1. Executive summary
2. Roles and responsibilities
3. Workshop findings
a. Workshop process
b. Assessment results, assumptions, and action items
c. Conclusions
4. Smart Grid drivers
a. Regulatory imperatives
b. System capacity and forecasts
c. Generation resources
d. Customer involvement
e. Media involvement
5. Smart Grid plan
a. Required technologies
b. Business case summary
c. Plan for execution
d. Communication plan
e. Revision plan
6. References

Table 4
Sample outline of a smart grid roadmap document

theory sounds simple, but again — for an industry historically separated into silos of generation, transmission, distribution, and operational categories — implementing two-way, real-time communication requires nothing short of a cultural shift. An assessment of (and necessary improvements to) current communications methodologies and media must be considered. Communications outreach also must include customers and regulators as required.

The following key message points should be prepared as part of the communications strategy:

- These are the business drivers
- These are the priorities
- This is the business case
- This is the roadmap

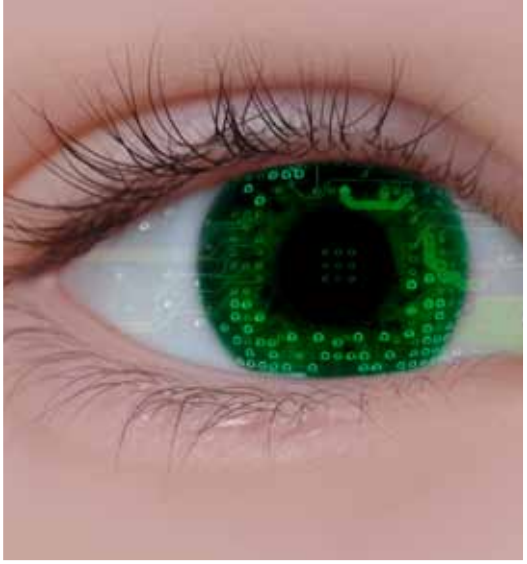
Part of a successful communications strategy is repetition. While the Smart Grid makes sense conceptually, it should not be assumed that the "reality" of it will be easy to process and/or execute. Repetition, patience, and taking advantage of consultants, peers, and industry resources make the journey to a Smarter Grid and Smarter Utility feel more deliberate and achievable.

CONCLUSION

While there is a competitive "rush" to Destination Smart Grid, care must be taken in mapping the utility's own individual journey. The regulatory and operational landscape of moving to a Smarter Utility is highly complex. Trying to keep up with other utilities at the expense of research-based strategic planning can result in costly missteps and repeated component upgrades as the electricity market continues to evolve.

A proven five-step methodology for mapping the utility's unique journey ensures that the roadmap is clearly documented and communicated so that all stakeholders understand the objectives and business drivers behind building a Smarter Grid and are working from a common comprehension of the challenges.

In addition, as the Smart Grid technology landscape continues to evolve and change, a Smart Utility will periodically meet to reassess business drivers and available technology offerings, evaluate progress against the business case and roadmap, and evaluate the effectiveness of the communications strategy and use of implemented Smart Grid technologies. wn



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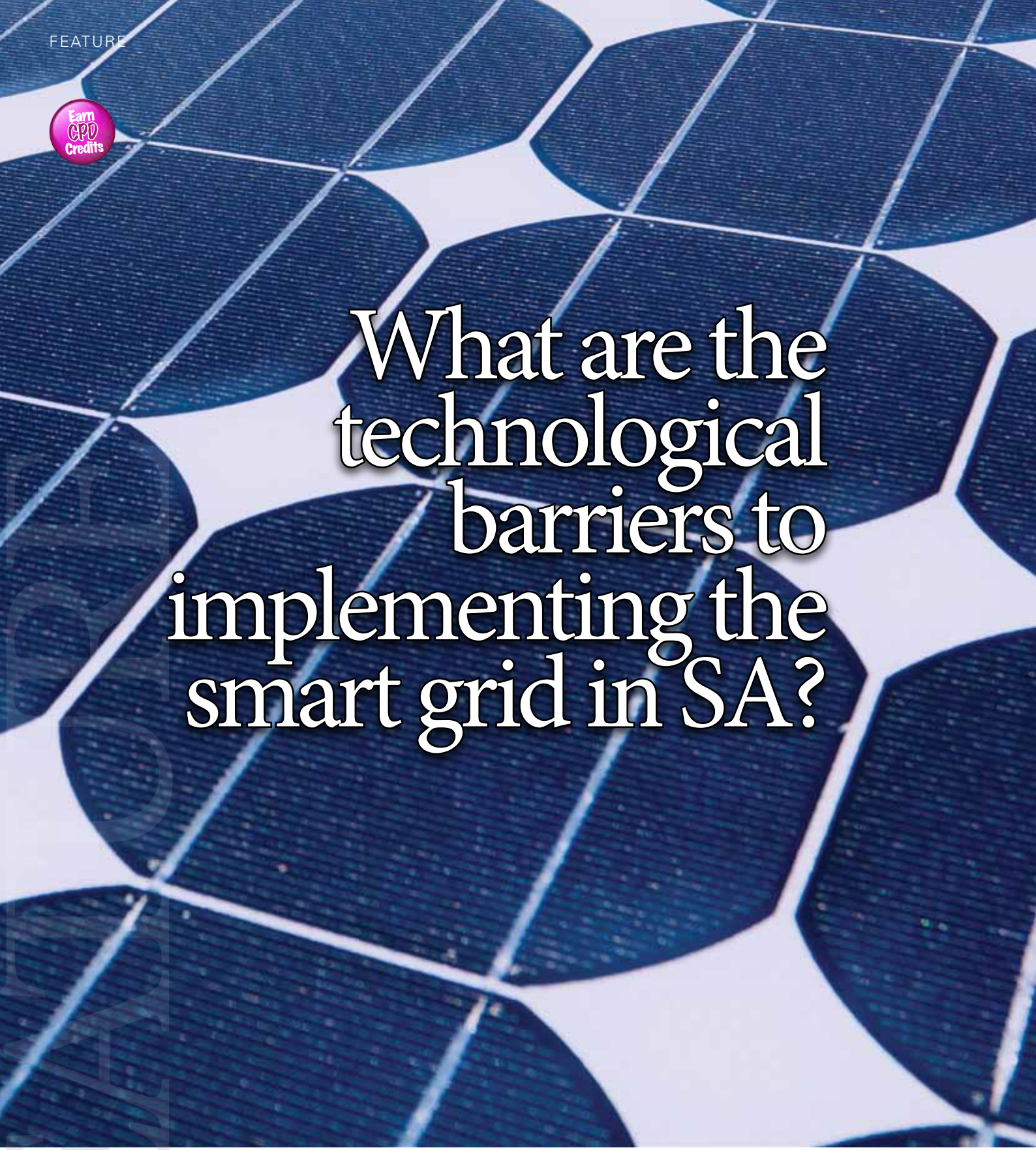
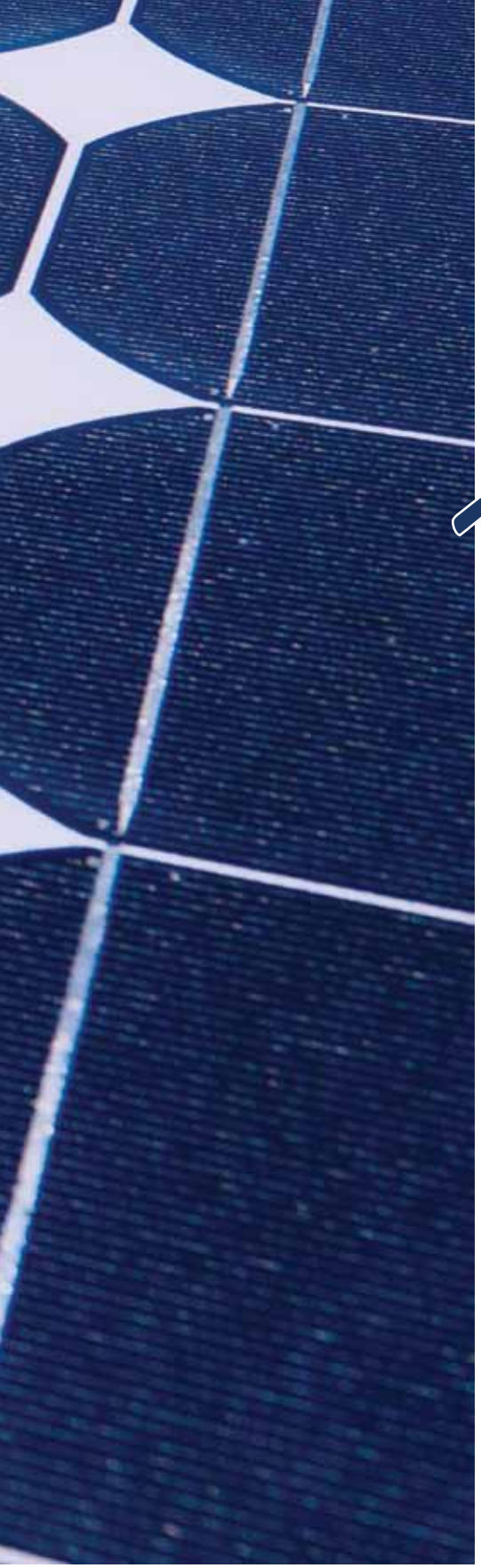


What are the technological barriers to implementing the smart grid in SA?

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



A smart grid can be defined as an evolved grid system which has been expanded through the addition of intelligence that manages electricity demand in a sustainable, reliable and economic manner.

The smart grid allows the integration of all types of power generation and all power using elements. Smart grids are an integral part of Smart cities.

FOUR KEY PLAYERS

The smart grid requires the involvement of four key players:

1. Government, integral to which are regulations, frameworks and policies.
2. Utilities comprising Eskom and Independent Power Producers (IPPs) which are now on board.
3. Vendors, which are Eskom and municipalities, and their role is currently relatively small until the power grid is properly deregulated.
4. Consumers or the end users.

BENEFITS OF THE SMART GRID

A smart grid alone does not provide energy savings, it facilitates the intelligent use of the available energy. In conjunction with a Smart city, the benefits of the smart grid can be summarized as follows:

- Delivering energy efficiently and reliably
  - To boost efficiency, electricity needs to be consumed at source. The reliability of the network is then inherently relieved and provides an opportunity with investment and careful management to be improved and uptime increased.
- Capacity for integrating renewables
  - This involves the integration and hosting of renewable energy, such as photovoltaic (PV), wind and biomass.
- Enabling customer control
  - By providing information, a smart meter enables customer control and information. This type of data allows the energy consumer to know the amount of electricity being used, when it is used and by which appliance.
- Stimulating a new industry
  - The smart grid brings about a whole new industry of technology, intelligence and efficiency previously absent. This is further explained in the following paragraph.

The grid was originally designed for the supply of low-cost abundant energy sourced far away from where it was required by consumers. Renewable energy, eg. solar and wind, then started to contribute to the grid. However this did not make the grid a smart grid, but a grid with some green energy suppliers. Electricity vehicles then entered the picture, where vehicles can be charged from the grid.

In future, the smart meter contributes to the smart grid by helping consumers decide who to purchase energy from, and how best to utilise electricity. It should be noted that the smart meter is only one constituent, albeit a vital constituent, of the smart grid. The key to future success is unlocking the data that the smart meter captures!

Smart Grid Barriers in SA

continues from page 35

TECHNOLOGICAL BARRIERS

The major barriers to implementing the smart grid in South Africa are as follows:

- Original design and intent of the grid
  - It is important to note that we are not building a smart grid or Smart city from the ground up in South Africa. We have inherited cities and a grid that we need to morph into the most sustainable solution.
- Public perception as smart grids are rolled out
  - Contrary to what a large percentage of the public appear to believe, smart meters and smart grids do not lead to increased energy costs. It has been unfortunate that the roll out of this key component has coincided with electricity increases.
- Financing challenges
  - These present opportunities for venture capitalists to embrace the developing smart grid and capitalize on opportunities that did not exist before.
  - Policies and regulations
  - Communication is vital here in order to clearly communicate the roadmap of the smart grid. Some cities in South Africa have found this to be a challenge, and instead embarked on a process of rolling out with little supporting communications. Other cities have really embraced the opportunity and are leading by example.
  - Policies and regulations are discussed in more detail under the sub-heading below:

POLICIES AND REGULATIONS

The technological barriers to implementing the smart grid in South Africa are as follows:

- DATA PRIVACY AND CYBER SECURITY: In connecting a smart meter every electrical device has a specific electrical thumb print so to speak detailing elements such as in-rush current, duration of consuming power, etc. This information, once in the smart metering central repository, provides any marketer with valuable insight into consumers, without the consumers explicitly allowing such information to be made available. A further risk is that such data would need to be secured through various levels of protective barriers from hackers and fraudulent activities.
- OPEN STANDARDS FOR INTEROPERABILITY: Regulations and frameworks can stifle the market, and this can be prohibitive as it may stifle ingenuity, which is needed for the smart grid to grow in its early stages. Once the early stages have been implemented, it is then appropriate for the different vendors and mechanisms to interoperate.
- LONGEVITY OF SOLUTIONS: In designing and implementing smart grids, energy industry players need to ensure both products and installation techniques are of adequate quality and safety to ensure the solution outlasts the deployment period.
- CONNECTIVITY REQUIREMENTS: Connectivity can be achieved through a number of different mechanisms such as Zigbee, RF, WiMAX, Broadband or electrical cable. Without the connectivity in place, the data cannot be relayed back and made available for use.
- SKILLS SHORTAGES: These are not only limited to the so-called green-collar trade, but affect all levels of skill. Creation of the smart grid and smart cities is a reasonable new initiative. University graduates in this field are academically focused without a true understanding of the technology, the digital space or smart networking. However, once graduates build up experience, they are in demand and may be "poached", in particular by overseas organizations. Who will then maintain and support the smart grid and smart cities? This leads to the topic of "The smart grid in the South African context".

THE SMART GRID IN THE SOUTH AFRICAN CONTEXT

Some interesting events have taken place over the last three years, which have brought South Africa close to the implementation of smart grids. These events are recorded below:

- 49M (million) was launched by Eskom due to the strain on the grid (March 2011) and to assist in the reduction of electricity. It was also a novel way of educating energy users about their behavior and consumption patterns.
- Renewable Power Supply Phase 1 commenced with power stations and renewable energy being incorporated into the grid (Nov 2012).
- Protection of Personal Information Act (POPI) dealing with protection of valuable information was introduced (Feb 2013).
- National Broadband Policy was signed in (Nov 2013).
- National Development Plan is in place and ready for implementation (2014).
- Eskom black-outs loom again (March 2014).
- Johannesburg's City Power targets the roll-out of 55,000 smart meters (June 2014).
- Bitcoin, the first real, independent global virtual currency, is in place for use in

smart meter electricity top-ups and to support electricity payment (May 2014).

KEY SOLUTIONS

Are we competently preparing for what the future holds? What are the solutions required to do so?

Complete stakeholder buy-in, as outlined in the four quadrants under "Four key players", is essential for the successful roll-out of smart grids in Sough Africa. Integral to this is connectivity and communication between all industry players. Regulations need to be put into practice in such a manner as to encourage this behaviour, ie. Ingenuity in the early phases followed by ongoing implementation in accordance with specific processes and protocol.

The roll-out plans need to consider a staggered approach. Residential, small business and industrial implementation should be segmented, starting in the residential market, and then moving into business and finally industry. This allows large amounts of data to be processed without influencing the industrial energy consumers.

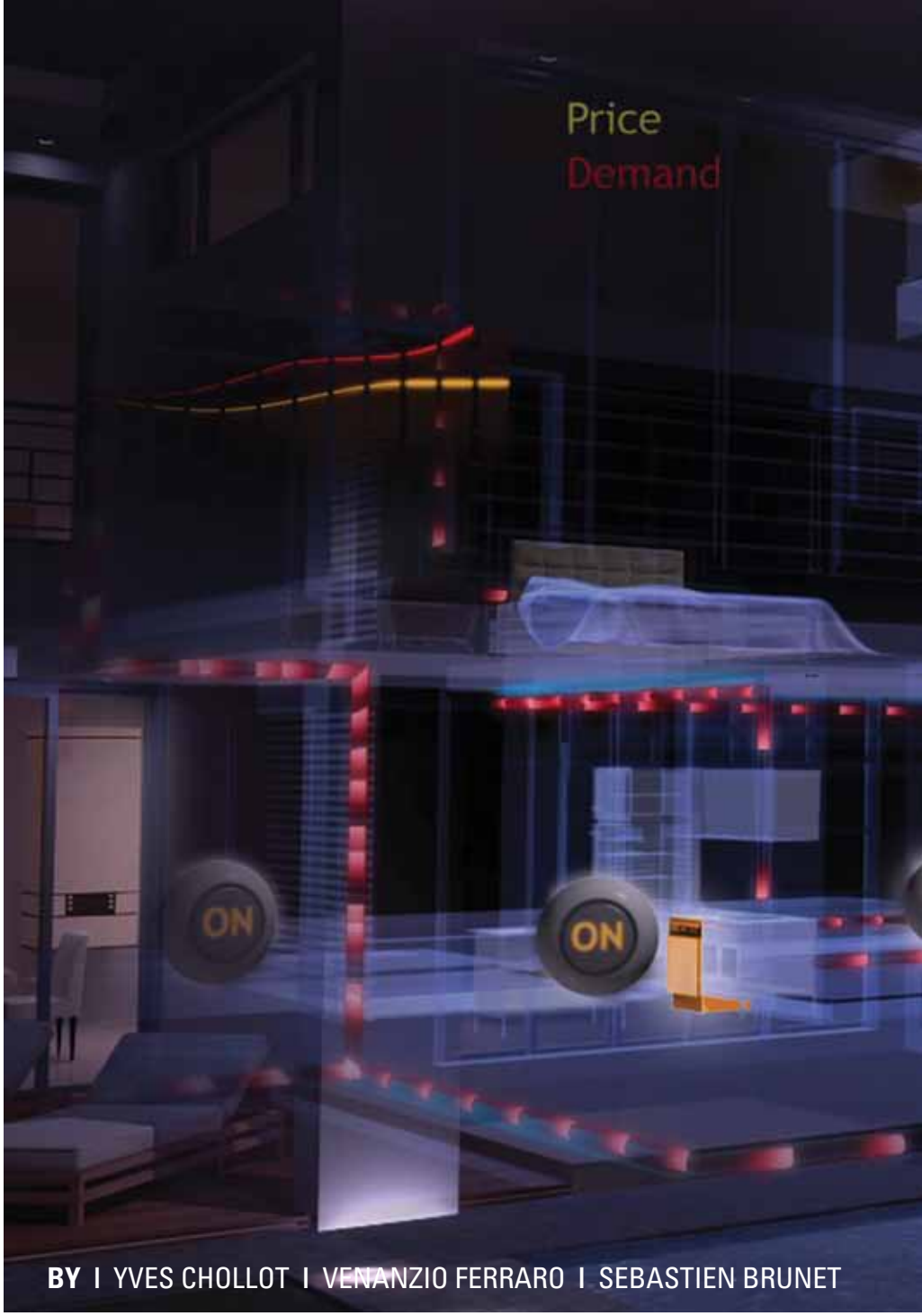
Financial solutions are, of course, critical. The National Empowerment Fund is leading this space through the support and drive for venture capitalists.

A "Pull vs Push" paradigm should be adhered to. All stakeholders should be "pulled" to smart grids and smart cities, as opposed to punitive legislation being used. Offer the carrot not the stick.

Finally, smart data management is non-negotiable. It is this intelligence that facilitates the real benefit of the smart grid. It enables data to be mined and accessed, and information surrounding supply and demand, such as the amount of power needed during peak hours, to be obtained. Smart data management informs industry players what the viable procedures and trends are that should be followed, and ensures smart cities can be built around these. wn

Earn CPD Credits

Billing and quality measurement are crucial issues for the smart grid, and medium-voltage (MV) metering unit are integral to making the grid smarter.



BY I YVES CHOLLOT I VENANZIO FERRARO I SEBASTIEN BRUNET

Thanks to screened insulation technology and instrument transformers optimized for digital meters, it is now possible to propose very compact metering solutions. This paper describes how more compact meters enhance the MV tariff metering system. Specifically, it presents the benefits of compact and pre-engineered metering units.

The purpose of this paper is to describe a technical solutionable to improve the MV tariff metering system with benefits in terms of size and robustness. In the smart grid context billing and quality measurement are crucial issues and the MV metering unit is one of the main steps to making the grid smarter. Thanks to the use of instrument transformers optimized for digital meters and to screened insulation technology it is now possible to propose very compact metering solutions.

The specification of metering units should reflect this technology improvement, moving away from individually specified components to a more functional specification.

INTRODUCTION

Public distribution networks as well as industrial MV networks usually position metering units in MV/LV substations (Fig. 1).

In these substations, MV or LV metering units bill the energy supplied to private customers, buildings or industrial plants. MV metering is generally preferred to LV

Compact metering solutions for harsh environments

metering when the installation requires one MV/LV transformer above a certain level of power or more than one MV/LV transformer. For instance, MV metering is used when power exceeds 1000 kVA in France or 250 kVA in Italy.

MORE CONSTRAINTS ON FOOTPRINT

In the past, the MV tariff electricity meters of industrial sites was located in a large cubicle part of the MV panel. This solution was simple and cost-effective.

The area taken up by the metering cubicle was not a big issue because MV metering was dedicated to a small number of customers like large industrial sites with additional MV/LV transformers and most of the other customers had tariff meters on LV side. The large width of MV metering cubicles was also an advantage for maintenance and replacement of MV sensors.

Nowadays, due to the lack of space available and costs, the global trend is to reduce the size of equipment. It is the reason why new compact Ring Main Units (RMU) have been developed while metering units have remained the same for years. It is now time to consider new solutions for metering applications.

For example, meter devices based on microprocessor technology require very low power signals enable the reduction of the MV sensors size giving the possibility to considerably increase the range of use of the sensors.

Compact Metering Solutions

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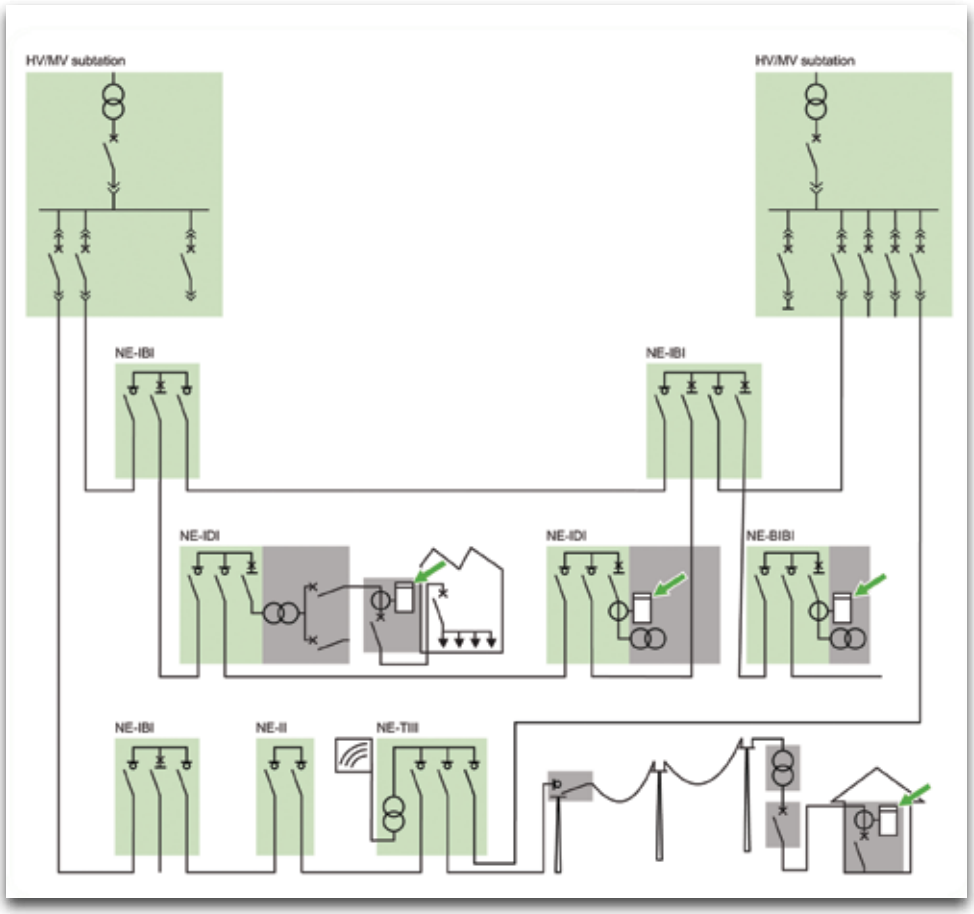

Fig. 1 - Position of metering units

Increasing demand in metering equipment in recent years, due to the development of smart grids and the deployment of distributed generation, the number of electrical substations with MV tariff metering and sub-metering has continuously increased.

A higher level of measurement is required to combine more functions than just the tariff metering. Now smart meters are used to supply data:

- To monitor the energy quality provided by the supplier (Voltage dips, Voltage profiles)
- To manage the Volt VAR of the network by both utilities and customers.

The trend is also to offer new services to customers to improve energy efficiency of industrial buildings, by multiplying the number of metering and sub-metering units to analyse and to bill the energy at the correct consumer level.

For example, consumers' load curves will be used with French Linky smart-meters [1] to build day-after curves.

This will enable new applications for:

- Optimizing the set of transformers,
- Reducing losses. Balancing three phase currents and reducing neutral current will reduce losses,
- Monitoring transformers & tap changers.
- Disturbance waveforms showing the origin of faults [2].

MAINTENANCE ISSUES OF THE METERING CUBICLE

Increasingly, utilities require solutions able to better withstand harsh environments in order to increase the availability of the grid and to limit maintenance. However the traditional metering cubicle is often a weak point of the electrical substation.

Metering units are comprised of MV busbars with current transformers (CTs), voltage transformers (VTs) and optional HV fuses in a cubicle with a conventional air insulated system (AIS). The VTs are fragile and must be disconnected for most maintenance operations.

Certain ferro resonance problems can appear and above all VTs must be disconnected or the cubicle power frequency tests is a strong weakness for maintenance operators. Because of pollution and humidity, a corona discharge can be revealed which can accelerate ageing of the metering unit. A cleaning service is then mandatory and this operation is delicate due to the forms of the CTs, VTs and fuses.

Some manufacturers have developed airtight or waterproof cubicles with a high level of protection to face up to harsh environments but this technical approach brings considerable additional costs to the cubicle.

NEW TECHNOLOGY FOR METERING UNITS

VOLTAGE TRANSFORMERS

The technology and design proposed is totally insulated and screened, composed of:

- Solid and screened bus riser,
- Three phase to earth VTs, solid and screened,
- Three ring type CTs, solid insulated.

The VTs are located on front for easy access for maintenance and easy disconnection without HV fusing but with removable links for commissioning and replacement.

Thanks to the insulated and screened design of all the components, they are insensitive to harsh environments and may be located in a compact cubicle without the risk of partial discharge.

The VTs are compliant with class 0.2 according to IEC 60044-2 standards [3].

CURRENT TRANSFORMERS

The CTs are the traditional ring type, which are insensitive to harsh environments thanks to insulated and screened bus riser. The CTs are compliant with class 0.2 according to IEC 60044-1 standards for 100/5 until 600/5 transformation ratio and class 0,5S for 50/5 [4].

BENEFITS OF A SCREENED SOLID INSULATION

The Screened Solid Insulation System (2SIS), means that the entire main circuit is solid insulated and earth screened, meeting the requirements of the "accidentally touchable" protection grade defined by IEC 62271-201. No live part of the main CT and VT circuits are exposed to the open air.

Double insulation is in place everywhere between the user and the MV circuit by the conventional protection of the earthed metal cubicle plus the earth-screened solid insulation of the main circuit and components.

This technology gives two advantages to the metering unit.

Firstly, the insensitivity to harsh environments is greatly improved:

- The metering unit is not affected by climate, temperature, condensation, dust, etc.
- No need for cleaning servicing
- Extended life expectancy (designed for 40 years).

Secondly the risk of internal arcing is reduced as the design includes phase per phase screened insulation over the entire MV path.

BENEFITS OF A COMPACT AND PRE-ENGINEERED METERING UNIT

OPTIMIZED SIZE

2SIS technology combined with the choice of ring CTs and pre-engineered VTs allows a reduction in the distances between the devices (CTs, VTs, bus) as there is no electric field between them.

Fig. 2 - Size of the metering unit can be reduced to 375 x 900 x 900 mm

It is now possible to optimize the size in a reduced footprint of just 375 mm width, 900 mm depth and a height of 900 mm, and significantly reducing by 2 or 3 the width of the traditional metering unit while keeping easy accessibility to the instrument transformers.

VERSATILE ARCHITECTURE

This technology enables a versatile architecture where the VTs can be placed upstream or downstream the CTs and the bus bar can be connected at the top or below the sensors.

NO HV FUSED VTS

Voltage transformers are often fuse-protected in Air Isolated Systems (AIS), however using fuses at this level brings problems.

Some UK or French Electrical Utilities, do not recommend fused VTs in Gas Isolated System (GIS) and with the 2SIS technology, fuses aren't useful:

- The probability a fault occuring is drastically reduced compared to AIS technology because the VT is insensitive to harsh environments.
- Corrective maintenance is easier because the damage caused by a fault in the cubicle is limited. The risk of a phase to phase fault is reduced and all the faults which could occur inside the VTs become earth faults.
- The VT reliability is better than the fuse system including its connections. Using fuses gives a lower availability and does not improve the protection of the installation.

Compact Metering Solutions

continues from page 41

SUITABLE FOR MOST APPLICATIONS

Unlike traditional large MV metering, a pre-engineered solution cannot cover all the applications and performances which are specified by DNOs.

For example,

- Some utilities require that their own CTs or VTs are installed in order to optimize the replacement operation of faulty sensors with a dedicated stock.
- Some utilities require high accuracy levels for very low rated current: i.e. 20/5 ratio with 0.2 S class is equivalent to require an accuracy of +/- 1.5 mA at 0.2 A.
- High level of power for VTs: 30 MVA.

These specifications are patterns from the past and have led to huge measurement transformers and the large size of the tariff metering cubicle.

A global specification, including accuracy of sensors and meters should be addressed to better optimize the system. As an example, it is not useful to choose a CT with a ratio of 20/5 which is much bigger than with a ratio of 100/5 and doesn't allow future customer load increases. The 100/5 CT class 0.2 S allows to measure from 120 A to 1 A with accuracy and remains accurate enough until 0.1 A (with a starting measurement of 0.1 % x In) which is convenient for most applications. The typical performances are illustrated in (Fig. 5 and 6).

PROPOSED SOLUTION, INCLUDING THE SMART METER

The proposed solution is flexible. Standard outputs from the CTs and VTs complying with international standards [3], [4] are usable.The architecture is open to digital meters used by the DNOs as well as various models of meters depending on the applications.

A global solution may be proposed with a meter complying with any part of the IEC 62053-xx series, including power quality features [5].

CONCLUSION

Unlike conventional metering solutions which are air insulated (AIS technology) and larger, the concept of a metering cubicle fully solid insulated and screened (2SIS technology) gives a more compact metering unit, and harsh environment withstand.

This design reduces by 2 or 3 the width of the metering unit, and offers a pre-engineered solution, including all the sensors and pre-tested connections.

The metering unit has been designed to adapt easily to a smart meter, but a more global solution can be provided, including power quality monitoring compliant with IEC 61000-4-30 Class A.

As with most systems utilized by electric utilities, the PQ system has developed and will change over time.

Revenue data is also utilized for billing and SCADA purposes. For example, in the Distribution substation, a device will use IEC60870-5-104 over Ethernet to communicate with SCADA while allowing a MODEM connection to the billing software, and a GPRS connection to the Power Quality Analysis software. wn

Single secondary metering VT (kV/V)				
Rated voltage (V)/Power frequency withstand				
7.2/20/60	7.2/32/60	7.2/28/75	12/42/75	17.5/42/75
$3/\sqrt{3}$ to $6.6/\sqrt{3}$ kV	$6/\sqrt{3}$ kV	$6/\sqrt{3}$ to $11/\sqrt{3}$ kV	$10/\sqrt{3}$ kV	$10/\sqrt{3}$ to $15/\sqrt{3}$ kV
$100/\sqrt{3}$ V $110/\sqrt{3}$ V	$100/\sqrt{3}$ V	$100/\sqrt{3}$ V $110/\sqrt{3}$ V	$100/\sqrt{3}$ V	$100/\sqrt{3}$ V $110/\sqrt{3}$ V
Power and precision class				
5 VA to 15 VA cl 0.2				
5 VA to 30 VA cl 0.2				

Fig. 5 - Usual VTs characteristics

Transformation ratio	50/5	100/5	150/5	200/5	300/5	400/5	600/5
Power (VA) with cl 0.2S Fs < 5	n/a	2.5 to 5	2.5 to 10	2.5 to 15			
Power (VA) with cl 0.2, Fs < 5	n/a	2.5 to 5	2.5 to 10	2.5 to 15			
Power (VA) with cl 0.5s, Fs < 5	2.5 to 5	2.5 to 10		2.5 to 15			

Fig. 6 - Usual CTs characteristics

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Lightning safety for shelters

Every year, lightning strikes result in property damage and even the death of people and animals. Those people finding themselves exposed in the open during a thunderstorm, such as golfers and hikers, are especially at risk. Severe lightning injuries and fatalities are reported annually from all over the world, especially on golf courses, making shelters vital to protect golfers from the effects of lightning. The points below are not limited to shelters on golf courses, but are equally applicable to hiking shelters, and so on.

BY I ALEXIS BARWISE I MD I DEHN PROTECTION SOUTH AFRICA (PTY) LTD

These shelters must not only protect from storms and rain, but also from the effects of a lightning strike. There is no question that shelters must be equipped with a lightning protection system, as golf course operators have a high duty of care towards their members / golfers.

These shelters should not be located in exposed locations; for example, on hilltops, at the edge of woodland, or under single trees. Shelters are only lightning-proof if:

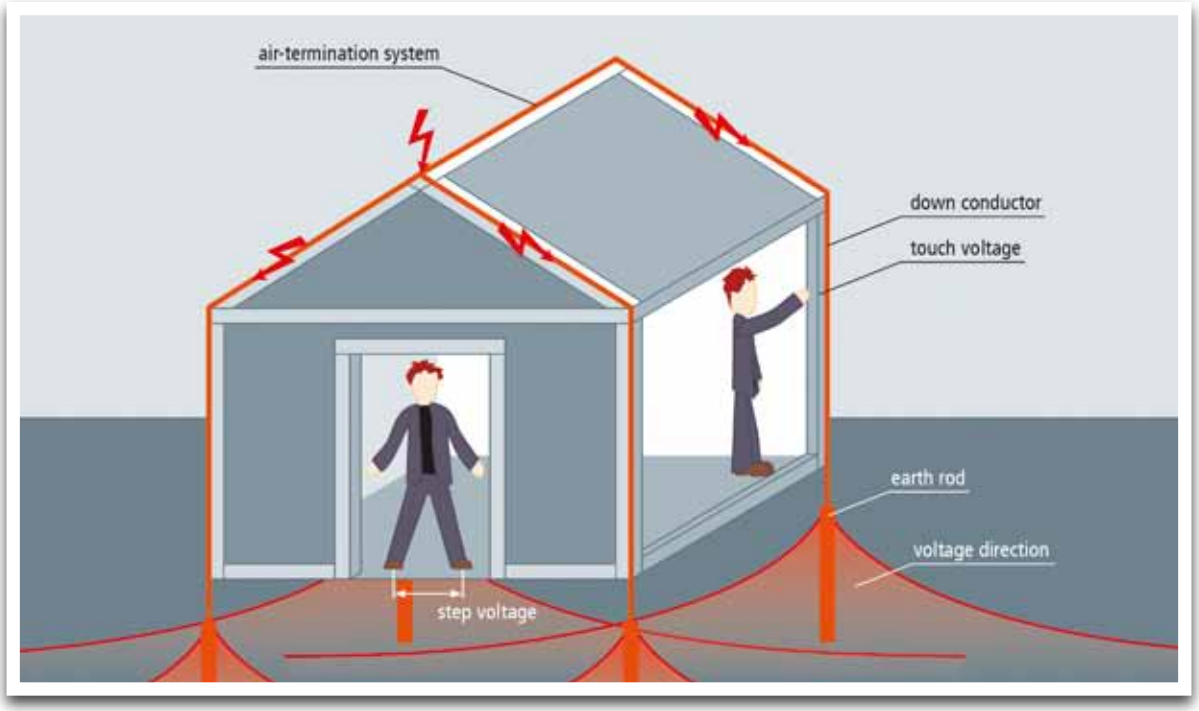
- they are equipped with an adequate lightning protection from storm and rain, but also from the effects of a lightning;
- conductive systems, such as electrical cables, are included in the equipotential bonding; and
- suitable measures for preventing touch voltages have been taken.

LIGHTNING PROTECTION

Frequently, a lightning protection system is simply a lightning rod. The function of a lightning rod is to intercept lightning and to safely conduct it to the ground to prevent dangerous sparking, thus protecting the structure from fire and mechanical destruction. Generally, the lightning protection system of a shelter consists of a rooftop air-termination system (air-termination conductor and/or rod), wall-mounted down conductor (down-conductor wire) and earth-termination system (commonly called earth rods).

The formation of a high lightning voltage in the ground, also referred to as potential gradient area, also presents a risk to persons in the shelter. This voltage may be applied to the feet of a person standing on the ground. It is therefore also called step voltage. Moreover, persons must maintain an adequate safety distance to the lightning rod to prevent dangerous touch voltages.

Effective lightning protection measures that protect golfers and hikers from the effects of a lightning strike can be implemented in shelters with a relatively low effort. Apart from technical measures, it is equally important to know what to



do during thunderstorms. In an upcoming thunderstorm, you should seek shelter immediately and stay there until the thunder or lightning has ended.

The additional considerations are based on commonly used wood shelters.

PREVENTION OF TOUCH VOLTAGES

To prevent dangerous high touch voltages, an adequate safety distance must be maintained between the lightning rod and the persons in the shelter. In a shelter of about three metres by three metres, with an eaves height also of three metres, a safety distance of at least 15 centimetres is required.

If the shelter has a minimum height of approximately three metres, the safety distance to the rooftop lightning rod (air-termination conductor or rod) is already maintained. However, it is more difficult to keep an adequate distance to the outer walls. Therefore the wall / wall construction where the lightning rod (down-conductor wire) is conducted to the ground must have an adequate wall thickness. To connect the lightning rod with the ground, earth rods (metal rods of a defined length made of material appropriate to the local conditions) are commonly used for this purpose. On each down conductor, the earth rods are vertically buried in the ground at a depth of about six metres to nine metres, depending on the type of ground.

Log-structured shelters usually have this wall thickness. However, the situation is different when it comes to sheds with thin wood walls. In this case, the down conductors must be installed directly at the outer edges, near the wall construction, to ensure the maximum wall thickness.

Another possibility to maintain the safety distance required to protect shelters in case of a lightning strike is to use highly insulating lightning rods. This is essential for shelters that are smaller than those described above.

PREVENTION OF STEP VOLTAGES

Dangerous high step voltages, as a result of strikes into the lightning rod of a shelter or nearby lightning strikes, must be prevented. To this end, there are two options:

Prevention of dangerous step voltages by insulating the ground. This means that the floor must be made of a five centimetre asphalt layer. As an alternative, a wood floor can be used, if it maintains a sufficient distance from the ground to ensure adequate ventilation and that the wood floor remains dry.

Prevention of step voltages by means of potential control. Another method of insulating the floor involves the integration of a finely meshed metal grid; for example a reinforced steel mat, laid in concrete or a mesh earth electrode, with a mesh size smaller than one metre by one metre, laid directly in the ground below the shelter floor. To ensure a long service life of this metal grid, it is advisable to use ten millimetres round conductors made of V4A stainless steel. These round conductors should be installed 0.1 metres below the ground surface at intervals of one metre by one metre and must be connected with adequate clamps on all cross points and down conductors.

CONCLUSION

In general, persons must stay in shelters for about 30 minutes after they hear the last rumble of thunder. Only then, the thunder cell is far enough away. Shelters on golf courses or hiking trails require both a lightning rod and adequate measures to reduce the risk of impermissibly high touch and step voltages. As described above, these measures can be implemented by simple means. wn

Empowerment

Genuine empowerment means to have an internal feeling and buoyant ennoblement that one has the freedom and capability to decide and carryout certain functions in his/her own way towards a higher and integrative purpose without fear. It is a feeling that conveys a sense of responsibility and accountability for one's actions. It is a feeling that enthrones self-control, self-organising and autonomy in an interdependent system (ecosystem).

BY I LOVEMORE CHILIMANZI

EMPOWERMENT FROM AN INDIVIDUAL PERSPECTIVE

Children are generally dependent on their parents for nutrition, security, social needs etc. As they grow, however, they develop methods and mechanisms to deal with some experiences. The most general way is to use cultural methods of dealing with common problems whilst using unique tactics or techniques for particular experiences (independence). As human beings we, therefore, by nature adopt a culture of our society at the higher level, that of our community, our school, our group and that of our clique within our group whilst exercising our unique talents, at the lower end. From this perspective our minds are mainly inscripted from outside. Our reactions to stimuli are empowered by these cultural external bombardments that have been inscripted on our minds. These reactions are rooted in collectivism which is not identified with a particular anchor. This is why the behaviour of many people is different when they are in different places (political gathering, football match, live music show, the pub, the church etc.).

From a psychological and philosophical point of view, life has meaning if it answers to what is its purpose and source. Therein lays the changeless anchor, an anchor that transcends our mental capabilities, is a source of endless power and control, an anchor that exerts on every individual the same influences. Whatever one believes in, if the belief does not converge on one supernatural centre of power and authority, one cannot escape floating centres i.e. standing with your feet firmly planted mid-air.

I have acknowledged that there is a centre of power and control for all things in God, so I shall base my article on this reality. I mean no offence to those that do not share the belief.

HARD WIRED GIFTS

Covey S, in his book, "The 8th Habit", says that every human being has three hard wired gifts, some of which have not been opened by some people since birth. These are choice, principles and four intelligences.

CHOICE

Covey says next to life itself, choice is the greatest gift we were given by our creator, for everything we do is by choice.

Everything that we do is a result of a stimulus that causes us to make a choice before we respond. In his popular book, "The 7 Habits of Highly Effective People", Covey says the choices we make are dependent on four human endowments of conscience, imagination, self-awareness and independent will. These are subjects in their own right. However, it is important to know that when we make choices, we do not control the consequences. When you pick one end of a stick you pick the other end also, if you throw yourself in front of a moving vehicle, the result is beyond you.

PRINCIPLES

Principles are changeless, timeless, universal, fundamental, self-evident truths or laws upon which strong ethical people base their lives. Being principled includes possessing such attributes as integrity, humility, fidelity, temperance/self-control, courage, justice/conscience, patience, industry, simplicity, modesty, the Golden Rule etc. People of a character ethic have a high moral authority conferred on them by others because of a principle centred life style. These people have a centre within themselves from which their disciplined/ fair judgement (power), moral authority and just control flow constantly when they are called upon to respond to any stimulus. They are consistent by nature because they are empowered from this centre. People of a personality ethic on the other hand, have floating centres and are vacuous and inconsistent. Whenever situations are beyond them e.g. death of a loved one, they reflect on principles that they have not cultured into their behaviour. Unless they do a genuine transformation to acquire this core, they shall forever behave like human pendulums.

FOUR INTELLIGENCES

According to Covey, in The 8th Habit, every human being has four intelligences. These are the physical intelligence that controls such systems as the respiratory,

Empowerment

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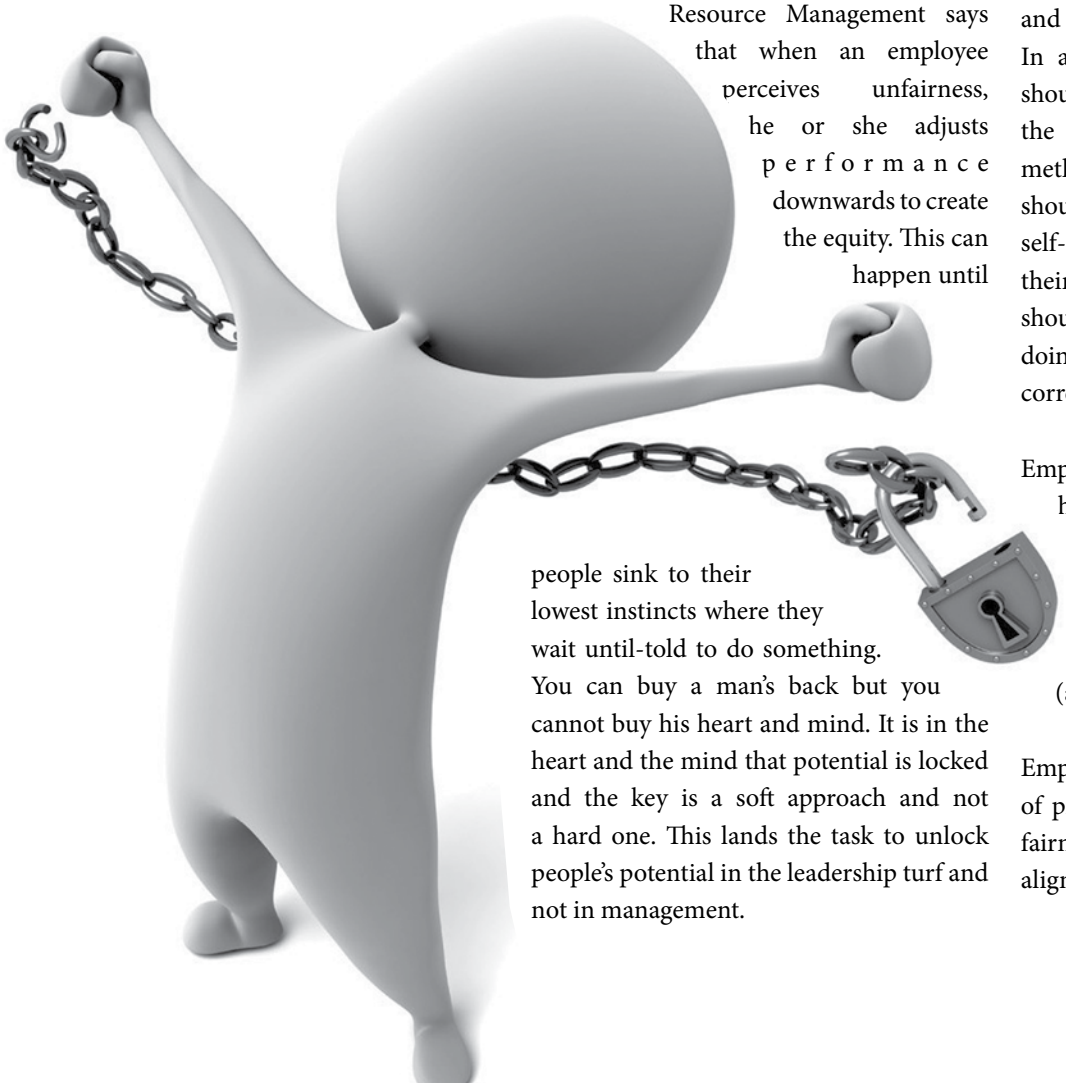
circulatory, digestive etc; the mental intelligence which is centred on the brain and controls such things as logical thinking, analysis, creativity etc.; the emotional intelligence which is centred on the heart and controls such things as relationships, emotions etc.; and the spiritual intelligence which connects with the transcendent source of power and authority.

A balanced development of all intelligences will produce a rounded, well behaved person. Our world has tended to value and develop only the mental intelligence. Most systems in the world (the education system, the legal system, competition in sport, business etc.) will testify to this.



Empowerment on a personal level entails these gifts are unwrapped and used in responsible ways. Balanced development of the intelligences; choices guided by the four human endowments; and principle centred judgement, authority and control integrated into one human being, give society the few shining examples that are admired by everyone.

EMPOWERMENT FROM AN ORGANISATIONAL PERSPECTIVE

From an organisational perspective, empowerment flows from the realisation that human beings can control the productivity that is locked up in their potential. The equity theory in Human Resource Management says that when an employee perceives unfairness, he or she adjusts performance downwards to create the equity. This can happen until people sink to their lowest instincts where they wait until-told to do something. You can buy a man's back but you cannot buy his heart and mind. It is in the heart and the mind that potential is locked and the key is a soft approach and not a hard one. This lands the task to unlock people's potential in the leadership turf and not in management.

THE LEADERSHIP ROLE

Leaders in an organisation have to play four roles to ensure success, according to Stephen Covey in, The 8th Habit. These roles are modelling, path finding, alignment and empowerment. This article concerns itself with the last role only.

EMPOWERMENT IN THE WORK PLACE

Empowerment in an organisation is about releasing employee potential by using the soft key. It is about servant leadership where leaders exist to render support, it is about aligning the individual need with the organisational need (co-missioning) in order to tap into people's passions, energy and drive in accomplishing worthy ends. In an empowering environment, leaders should exist as enablers and should name the required results without prescribing methods of achieving them. Employees should be enthroned with self-control, self-management and self-organising in their roles (directed autonomy). They should be given feed-back on how they are doing to enable them to refocus and make corrections.

Empowered employees trust their leaders, hold them in high esteem as their role models and do not hesitate to approach them for advice. In empowering employees, leaders provide enabling resources, structures and systems (alignment).

Empowerment in an organisation is a fruit of principle centred (trust, sincerity, love, fairness etc.) modelling, path finding and alignment by the leadership.

IMPEDIMENTS TO EMPOWERMENT IN AN ORGANISATION

The major impediment to empowerment is lack of clarity between leadership and management roles in many organisations. Whilst all leaders can be managers, not all managers can be leaders. The loss of clarity normally creates confusion, frustration and paralysis with resultant loss of productivity. Many managers are not ready to cede control to their subordinates because they fear loss of it. Little do they know that empowerment transfers their control to self-control with the benefit of unleashing potential.

Where trust does not exist, employees will always be suspicious of efforts to empower them. True empowerment should flow from principle centred (trustworthy) leaders. There are strategies that can be used to empower employees in the work place. On a personal level, except for the physically challenged, people possess the ability to empower themselves when they choose to be of a character ethic instead of being of a personality ethic.

WATT?

EXPERT INDUSTRY ADVICE

WATT? is a newly established 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!

The rapid pace of technological change and product development is a global trend that affects entire economies. We may have access to more information than ever before, but is this information readily understandable? Does it give us insight into the fundamental issues? Is it precise and based on technical clarity?

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.

We hope that this section of the magazine not only becomes a regular feature, but that it is widely read and distributed among your peers. Remember, it can only become a success with the full participation of our readers! Send your burning questions to minx@saiee.org.za - subject 'WATT?'.

We look forward to hearing from you.
- Ed

QUESTION ONE

Is it worthwhile running a high efficiency motor on a variable speed drive?

ANSWER

Definitely. Using a variable speed drive (VSD) on a high efficiency motor will give improved efficiency and allow production output to be controlled. This is especially important today as companies need to optimise their manufacturing processes and, as part of this there is a much greater focus on energy savings.

It is a commonly held belief that a motor controlled from a VSD has a reduced efficiency and that it is therefore not worthwhile purchasing a more expensive high efficiency motor for such an application. The thinking is that one will pay more for a high efficiency motor but that the efficiency benefit will be lost because of the variable speed drive related reduction in efficiency. This is not correct. Let us consider an example. A low efficiency motor may for example have an efficiency of 89% whereas a high efficiency motor may have an efficiency of 92%.

When VSD driven the low efficiency motor may lose an additional 1% efficiency whereas the high efficiency motor may lose slightly less, for example 0.7%. The high efficiency motor related losses related to the VSD will always be lower than a low efficiency motor because of the improved magnetic properties of the higher quality core steel that is used. The difference in efficiency from low efficiency to high efficiency remains the same whether direct on line or VSD driven. The 3% efficiency gain remains when VSD driven.

The result is that the end user gets the benefit of the higher efficiency at all times whether on VSD or otherwise. This means that the energy savings of running a high efficiency motor with a VSD are substantially increased and payback time can be further minimised.

QUESTION TWO

What happens to motor efficiency when you change the motor's speed?

ANSWER

This question is often asked with the expectation of a "one size fits all" answer. This is not possible. Motors from reputable motor suppliers have very well defined efficiency levels based on the relevant IEC standards and are tested according to these standards. These values are published by all reputable motor manufacturers.

A user with a given load, for example a pump running at 62 kW absorbed power at 1 460 r/min, may therefore reference the relevant motor curve and know exactly at what efficiency the motor will run at that load. Users often want a similar answer related to variable speed drive (VSD) use. There are, however, no standard efficiency curves for VSD use. This is because of a combination of factors.

There are no relevant IEC standards defining what the VSD driven motor efficiency should be, nor are there IEC standards defining how such efficiency might be tested. And from a practical aspect there are many variables. Different VSD manufacturers have different default settings and different methods to achieve the best efficiency which means that the method to test efficiency is subject to these variables.

Furthermore, each different load responds to a change of speed in a different manner. For example the absorbed power of a centrifugal pump is proportional to the cube of the speed (P α N3), while for a conveyor the absorbed power is directly proportional to the speed (P α N).Different pumps with different combinations of head, density of media and other variables will also give different results. The nett result is that there is no standard against which testing can be done and the number of variables makes the provision of a set of standard curves impossible.

The lack of standard curves does not make a correctly designed solution impossible. Generally speaking a VSD is only used when speed variation is required. Regardless of all variables the energy saving or power saving corresponding to the changing speed will always be greater than the loss in efficiency.

Let us consider two examples. A conveyor that draws 100 kW at 100% speed and is driven by a 110 kW motor with 95,6% efficiency. At 85% speed the same conveyor would draw approximately 85 kW. The 110 kW motor would run at an efficiency of 95.6%, therefore the losses are 4.6 kW. When VSD driven the motor efficiency would be 95% at 100 kW, therefore the losses are 5.3 kW. The additional losses related to VSD use being 0.7 kW. The loss in motor efficiency should generally be between 0.5% and 1% and so the user will have a nett saving of about 14% regardless of the exact efficiency loss. This will be beneficial on a conveyor application where production output varies.

As a second example let us consider the same 110 kW motor driving a pump that draws 100 kW at 100 % speed. At 85% speed the same pump will draw approximately 61 kW. The additional losses related to VSD use remain constant, i.e. 0.7 kW. At the reduced load of 61 kW load the motor efficiency is inherently only slightly lower, 95.3%. So the "normal" motor losses are 3 kW. The total motor losses are therefore 3.7 kW. The total motor efficiency would be 94.3%. The end user therefore gains a saving of 39 kW due to VSD use but loses 0.7 kW due to additional variable speed losses. It is obvious that the additional losses are inconsequential by comparison to the additional savings.

There are some generalisations that can be made.

1. Motor efficiency is slightly reduced when VSD driven. At 50 Hz a 0.5 to 1% reduction can be considered normal.
2. For speeds other than 50 Hz, for example 25 Hz, the efficiency will be lower. In general an additional 1% to 5% loss may be considered. This is due to the reduced mechanical load rather than being due to VSD related losses.
3. The load power saving at reduced speed will always be greater than the efficiency losses. Therefore there will always be a net overall saving for the customer. wn

Answers provided by Zest WEG Group

The Foster Gang

Before my mind's eye I see them now; Robert Foster, aka Robert Ward Jackson, the most notorious gang in the history of South African crime; John Maxim, alias Maxwell, originally an American cowboy and Carl Mezer alias Smith the youngest of the gang and also the worst.

WRITTEN BY I AJH HOFFMANN
TRANSLATED BY I A HOFFMANN I SAIEE DEPUTY PRESIDENT

BACKGROUND

This story may be of interested to the SAIEE readers in terms of its connection to the Deputy President, André Hoffmann and the history of Johannesburg.

It was originally written by his grandfather and translated out of a book that he wrote called 'Op Die Spoor van Die Misdadiger' printed in 1948. - ED

2014 saw the centenary of the capture of the Foster Gang in Johannesburg - an event which involved many policemen in the city including my grandfather.

The story is related by my grandfather in the following translation.

According to my father (now deceased), my grandfather was the first policeman to be issued with a motorbike in Johannesburg.

The story my father told me, indicated that the bandits at the time considered this to be too significant an advantage and set him up by getting him called out to investigate a house burglary. While he was inside the house, they set fire to his motorbike and ran away. I am sure they would have re-issued him with another motorbike...

AJ Hoffmann was a Boer, he fought in the Boer war against the English at the time, but as circumstance would have it, he met an English 'Rose' at that time and they fell in-love, apparently *"He looked good on a horse"* according to what my father related to me about what his mother had told him, the third photo is of the family with my father as the baby.

This English lady, a Miss Acutt insisted the family be brought up English - something he respected and so my father (Frederick and his brother Eric) were raised English. Andries Johannes Hoffmann (my grandfather) was a waggon maker by trade and after waggons fell out of fashion he turned to Police work which he found out he was particularly good at. He also mastered the key African languages and vernacular to the extent that he earned the respect of the local population.

Detective AJ Hoffmann on the first-issued police motorcycle - 1914

The Hoffmann family with AJ Hoffmann as child.

My father mentioned to me that during the 1922 strikes on the Rand, Det. AJ Hoffmann - the policeman threatened to arrest my father (his son) if he left the family home in Johannesburg to try and go to work at his place of work - the Simmer & Jack mine.

My father had a job as an electrician at the mine maintaining the lighting and general electrics. AJH threatened to arrest FJH (his son) in order to protect him from possible injury or death as at the time the strikers were very militant and would have harmed or killed any scab labour.

AJ Hoffmann and Rose Adeline Acutt had two sons, Fredrick John Hoffmann (my father); and Eric Kenneth Hoffmann (founder of the Caravan Club of South Africa).

I believe that after AJ Hoffmann retired from the police he was employed by the Mines to handle labour issues given his command of the language and respect among the Blacks.

He authored the book 'Op Die Spoor van die Misdadiger' and wrote articles under

The Foster Gang

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the same title in the Outspan magazine. His Service number was No. 360 and Detective Head Constable AJ Hoffmann KPM was awarded the Kings Police Medal on 1 Jan 1925. Herewith the translated version of events as penned by AJ Hoffmann.

"I can still see Foster's thin face and his shaggy hair hung in tatters over his narrow forehead as I remember. His eyes were far from one another, and his lips thin and crooked. John Maxim was well built and wide, he was dark with a thick moustache. Carl Mezer was shabby and messy and there was a wild look in his eyes. He always looked a scared and pathetic figure.

As a detective my responsibilities were largely in locating native criminals, I seldom encountered murders committed by whites. But when the Foster gang was in operation, every officer was put on the trail of the bandits. I also had to participate in tracking these criminals.

Robert Foster was a criminal with a long list of misdemeanours. He was serving a long sentence, when he managed to escape from the Pretoria Central Prison. It was 1914 and I was at Marshall Square when the news broke. Instinctively every detective looked for their revolver. Foster was dangerous and we knew that he would be armed and would shoot if he was pushed into a corner. We also knew that he would soon have a gang around him, which would side with him against us. We all knew that we were going to get very little sleep while he was out and on the run.

We were aware that Foster bragged that he would escape from prison very soon and that when he had escaped and was free, he was going to pay the judge who sentenced him a visit to kill him. Now he had the first step carried out and we knew that he would return to kill the judge as soon as there was an opportunity to do so.

After his escape Foster lay low for a while, there was no sign of him anywhere. But we soon became aware that he was up to his old tricks. Several cases of burglary and theft were reported at stores and behind all the cases we determined that Foster was involved.One night there was a robbery at the Post Office in Vrededorp, they stole cash, large quantities of stamps and postal orders. By that time we knew that John Maxim was also with him. Besides the alias Maxwell, he was also known as the "Yank". He was a very proficient shot with a revolver. There was talk that he originally came to South Africa as part of 'Texas Jack's' gang. He was an excellent rider but it was as shooter that he excelled. He was crazy about shooting with a revolver. If someone threw a penny into the air, he could shoot a hole through the penny. If he did not succeed at such a show, he would walk around sullen and moody for days to come. The biggest insult one could do to him was to speak disrespectfully of his shooting ability.

Carl Mezer, then only 21 years of age, was also with them. He was previously in a juvenile detention facility for boys and was an extremely downtrodden individual.

The residents of Johannesburg had their hands in their hair and feared for their lives. It was the month of July 1914, and the outbreak of the First World War threatened but the rumours of war were insignificant compared to the rumours regarding the Foster gang. I remember the nights were very cold while I was trying to investigate and trace the Foster gang. There were detectives everywhere.

On July 17, the gang claimed their first victim. They raided the National Bank in Boksburg North and one man in the bank, Alex Charison, resisted. He was shot dead. Now no one could say where or how the destruction left in their path would end. The largest search South Africa has ever known began. We investigated every report and every rumour but all the leads amounted to nothing more than a dead end. The weeks slipped past and Foster and his gang were still at large. The war in Europe had already begun. There was much excitement in Johannesburg but Foster and his gang continued to stay in the headlines of the newspapers.

During the night of September 13th, the gang struck again. A constable gave a

report through to two sergeants stating that he has seen two suspicious persons in the neighbourhood of the Imperial Bottle Store in Mount Street. The sergeants, Robert Mansfield and Neil McLeod went there and saw Carl Mezer outside the shop, they apprehended Mezer immediately. But Mezer managed to scream as they caught him. Foster and Maxim stormed out of the shop and shot and killed the two sergeants. The constable managed to escape. Foster, Maxim and Mezer then escaped on a motorcycle. Further investigation revealed that Foster and Maxim were in the shop and on the verge of shooting open the safe in the shop when they were interrupted by the sergeants and Mezer's screams. Now the gang had three murders on their list of crimes. Previously, a constable was injured when he prevented them from breaking into a liquor store in Bertrams. He was later picked up in the street.

The search had intensified. As I arrived at the murder scene of the two sergeants on my motorcycle, a native told us that the three men drove off following the Natal Road in the direction of Heidelberg. Detective Kietzman, who was also there on his motorcycle with me, we gave chase after the gang. We were three miles beyond the City Deep mine and again we heard of the gang. At this point other natives told us that the three men had gotten off their motorcycle and ran into the plantations. We tracked the bike markings but there was no sign of them as yet. All day we pursued them following dusty roads and around farmhouses, our search proved to be fruitless. As I look back now I see how risky it was. I only have a small Webley revolver and I doubt Kietzman was armed. That afternoon we went to Regents Park, where according to information I was given, I would find the Foster Gang in a house there. Upon entering the house we found that it was empty. I'm sure if Foster and his gang were there, I would have been a dead man. At this time the detectives and police did not have weapons as the Government did not issue weapons. We had to make our own arrangements and cover our own needs. Yes if the gang was at home that day, I would not have been here now to write this story. Detective Charles Albert Mynott came across the gang a few days later and he was shot and killed.

Mynott along with another detective were patrolling the area. When Mynott passed by a house and saw Foster and Maxim busy working on a car. He immediately pulled his revolver and shouted: "Hands-up!" A shot was fired and Mynott dropped to the ground. The other detective was at that moment in busy in another street. A woman, who saw the shooting, recalled that Foster started the car and Maxim, Mezer and a woman, Mrs. Foster jumped into the car with Foster. The car was driven at speed through the gate and over Mynott's body and sped away towards the East.

The police headquarters had become a beehive of activity. Every available man was mobilised. Heavy trucks full with armed men were loaded up, I was one of them and we then drove along the highway towards Germiston. I can still remember that there was a strong wind blowing and it was bitterly cold on the open truck. But we become even colder inside just thinking about what Foster and his gang could do before they were captured. It was a difficult task and everybody hated them because of their cruelty. We also realised that anyone of us could be the next victim of Foster or the Yank's revolver.

The Police of the Rand warned us to keep our eyes open for a black car that Foster was driving. The order was for each car to stop and if a car failed to stop, the police had to shoot. As a result, and directly linked to this vicious gang, two innocent lives were lost. They were killed as if they were actually shot by the gang themselves. The first victim was Dr. Grace Springs and the second General de la Rey. They were both shot in the same night. General de la Rey with General Beyers was on his way from Pretoria to Potchefstroom travelling to Langlaagte, they were flagged down by the police. They say the car drove without lights and the occupants had total disregard to the orders given. A constable fired at the rear tire, but the bullet hit the hard road and thericochet entered the back of the car and mortally wounded General de la Rey. I can clearly remember the impression this tragedy had on me and many members of the police as well. Feelings during this period were very tense and there was talk of a rebellion. Later Beyers participated in the rebellion. Would de la Rey also have been involved in it? No one can satisfactorily give an answer to that question. It is certain that General de la Rey was highly respected and loved. He was a man with a strong form and a finely chiseled face, a great warrior. By a whim of fate he had passed away just by the police being on the trail of a gang of killers.

Dr. Grace, a former mayor of Springs with his wife were also traveling in a black car coming from Johannesburg. He was ordered to stop by the police but he ignored the order. A shot was fired and Dr Grace collapsed on the steering wheel. We attributed this tragedy to the Foster Gang. We were even more determined to catch the gang because the longer they were on

The Foster Gang

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the loose and on the run the more chance there was of innocent lives being lost. We were on their trail and the excitement rose when we found the deserted black car near Bedford, the farm of Sir George Farra. The police sniffer dogs were brought in and they followed the trail for miles over farmlands but again the gang was gone.

Once again we were closing in on them, some school children came to tell us that they saw some men enter a cave on the slope of a mountain. The cave was an excavation made by prospectors. Sergeant Grainer, two white constables and a native constable entered the cave, Sergeant Grainer walked ahead with a flashlight. A short way into the cave he found some burned papers and a little deeper into the cave he found a few more. Then a shot was fired but it missed Sergeant Grainer. He shot back and also missed. Then there was a succession of rapid gun shots. The daredevils just shot blindly. The torch was extinguished and the police retreated in the dark. One constable had a bullet pass through his helmet. The bullet just scraped his scalp; it was only a minor injury.

I will never forget the fuss it created when it became known that the gang was in a cave in the Kensington 'Koppie'. A large number of police rushed there and many people joined them all to see where the Foster gang was cornered. Day and night there were hundreds of people on the mountain slopes. Yet again the European war seemed very far away, because the catching of the Foster Gang caused a great excitement in the City of Gold, Johannesburg. Eventually the 'Jackals' were trapped, this is how I thought of them. Their opportunity for more robbery and murder were over. They committed cold blooded murder.

Large rocks along the slope were rolled down and completely closed off the entrance to the cave. Now there was no escape route for the 'Jackals'. At night, the entrance to the cave was illuminated with strong lights and armed police were on guard duty while the crowd remained there. There were a lot of curious onlookers that remained there half of the night. You could hear a constant murmur. 'Would the gang try to come out?' This question was on everyone's lips. But they could not escape because they would not be able to move the big rocks that closed off the entrance, cutting them off from the world.

Before the rocks were packed in front of the entrance the possibility was there that they could still possibly make a run for it and try and escape. The carnage this would have caused would have been very scary. Slowly but surely, it became clear that the gang's adventures were at an end and they were firmly trapped in the cave.

I stood a short distance away. The deputy commissioner of police was in control. I remember a detective removing a few stones and cupped his hands around his mouth and called out, that they should come out. The challenge echoed in the cave. The answer retorted - 'We will not!'
The detective then asked, 'Is Mrs. Foster, or you may call her Mrs. Jackson with you?'
'No', came the reply, 'It's just us three.'
'Where is Mrs. Foster?'

Foster said, 'She is in Germiston. I want you to send someone to fetch her.' He gave the address where Mrs. Foster was.
The detective then said 'If she comes, we will have to take away the stones. Then we will not tolerate betrayal.' Foster answered 'Good'.

It was a strange conversation and it made a deep impression on my memory. The whole thing was very strange. Here are the Police Force determined to apprehend the murderers and yet they are willing to accommodate Foster's requests. Foster had promised that if his wife was brought to him, he would hand over the revolvers to her and he and his two companions would walk out and surrender. If you now look back on that agreement that was made between Foster and the Police it surely is extremely strange, since this is the man who sooner or later would have no option but to surrender. How could anyone trust Foster's word as being the truth? This man after all was a murderer. He had shot and killed some of our colleagues and friends. He was a cold-blooded murderer. But Foster insisted he would not discuss surrendering before his wife had been brought to him.

I still remember how a pharmacist offered a few bottles of gas to drive the villains out of the cave, but the offer was turned down. There was no certainty about the nature of the effect this gas would have on them. There was a possibility that this could kill them and we wanted to apprehend them alive. If they lived, they would be charged with murder and sentenced to die at the gallows. The law would condemn them to death but apparently Foster and Maxim had already made a decision to die. I was always of the opinion that it was very unfortunate that Mrs. Foster was brought there because she only came to die.

The crowd was getting very restless and hostile. There was much booing. The people were asking the police if they were playing 'Hide and Seek' and whether they were a shop catering for the wellbeing of the despicable murderers.

When Mrs. Foster asked for a drink, the crowd became very sarcastic. Two bottles of tea were passed into the cave at the end of a long stick on followed by a pack of cigarettes, a cigar and matches.

Someone called out 'Perhaps we will be invited to dinner with them at the Carlton.' 'How much consideration do they, Mansfield, McLeod and Mynott have?' another called out.

'Oh, why do not you and embrace them?' There was general laughter. I remember how I thought about them, as 'Jackals.' There they are sitting, drinking tea and smoking cigarettes. Maxim would surely smoke the cigar and it would be the last cigar he ever smoked.

The seconds flew past as they decided to die staging a spectacular death. They must have had a lot of courage because it must be very hard to come to terms with your own death and to face death in the face. What would they be thinking in the darkness of the cave…. the last pull on a cigarette ... the last pull on a cigar ... their last thoughts knowing that this would be their last thoughts?

I listened to some of the spectators talking amongst themselves, hearing them say that Mrs. Foster will never come out of the cave alive. My thoughts had also gone to that direction, I felt sorry, and had compassion for Mrs. Foster, even though I never knew her at all. When this small unassuming woman dressed in black, with her eyes riveted to the ground, escorted by guards arrived, there was an eerie silence. I could feel the terrible tension that prevailed there, and I had a horrible premonition of the probable outcome this would have. Now, after more than thirty years I can still remember the look on her pale face and small mouth. She loved Foster. She came to him, although she knew that her fate was now sealed. I found myself wondering many times over the courage of a woman and I'm sure that little woman had the courage of a lion, since she was prepared to enter the cave where the reckless thugs were waiting.

Many times, that image of how Mrs. Foster stood before the cave, re-lived itself in my memories. At the time I felt that she knew she was going to meet her death and she was willing to do that. She did not hesitate at the entrance to the cave; she just disappeared into the darkness. The silence could be felt, although the crowd was even bigger now. It was bitterly cold ... an icy wind blew and the winter sun was very weak in the blue sky and wide fields lay all around us. In light of the events, after a few minutes of silence, things happened so quickly, I tried imagining what was taking place in the cave after Mrs. Foster had entered into the cave joining the gang. She probably first embraced her husband. Perhaps they had already made a decision to commit suicide in advance, but there is no certainty about this fact. Then the faint sounds of four shots were heard. The police and I stormed into the cave. In the light of torches', I came across Foster and his wife, dead in each other's arms. As we continued in the cave, a little ahead of us lay Maxim and Mezer they were closer to the entrance of the cave.

Two German Mausers, automatic rapid fire pistols, lay near to the corpses and it was clear that the shooting was done by Maxim. It was also clear that Mezer was afraid to die and he tried to flee, but Maxim shot him, then he shot two more shots, one of which killed Mrs. Foster and the other Foster, killing them in each other's arms. The last shot was when he shot himself.

It was the singular end of three pitiful lives. I could not help but feel sorry for the woman. I have a slight esteem, maybe not the right word, feeling of awe for the dead men. Mezer's, death and was reflected in the way he had collapsed in death just as pathetic as his life was. From a young age he had always been directionless, he grew up in bad company and perhaps was never given a chance in life. His eyes had the look of a wild rabbit. I can well understand here at the end why he tried to flee. He was still very young.

Foster had a heart of stone but there was no doubt that he died bravely. But why did he have to involve his wife in this? This I could not fathom out. Perhaps he thought it would be easier to die with a wife that he loved? This perhaps it a question that only a psychiatrist can give you an answer too. Because of her love for a murderer she died. Maxim… till the very end, he shot his target… His large body lay there, like a broken bag of corn.

As I came out into the sunlight, the chatter of people filled the air.
Frequently during my retirement I would calmly think about Foster and his gang. It was a blessing that the gang was cornered and destroyed. This must be the strangest story in the history of crime in South Africa, and those who took part in the hunt still speak of it. The handful of us that bear witness to the end of this history in the cave, will never forget the feeling. It was a singular tragedy. wn

Translated from the book 'Op Die Spoor van Die Misdadiger' by A.J Hoffmann

January

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

January is named after Janus, the God of beginnings and transitions; coming from the Latin word for door (ianua) as January is the door to the year.

1 January

1752 This date was known as Circumcision Style, because this was the date of the *Feast of the Circumcision*, considered to be the eighth day of Christ's life, counting from December 25 when his birth is celebrated.

2 January

1839 Louis Daguerre, the inventor of the pre-photographic process known as Daguerreotype, produced an image of the moon on a silvered plate. Due to the long exposure time, the image was little more than a blob.

3 January

1882 *"I have nothing to declare except my genius"* – the famous Oscar Wilde quote Oscar probably didn't say… According to historian Roy Morris, Jr.: *"No one actually heard him say it, but it sounded like something Wilde would have said, and by the time literary biographer Arthur Ransome quoted it first in his 1912 study of the author, the quip already had passed into legend."* **

4 January

1914 Leonardo da Vinci's *"Mona Lisa"* was returned to the Louvre Museum after it had been stolen in August 1911.

5 January

1952 Winston Churchill, UK's Prime Minister, arrived in the United States for an official visit, his first since re-election.

6 January

1991 *"The mother of all…"* has been used, in the Middle East and Greece, to describe the biggest or ultimate example of something for over two thousand years. It wasn't a commonly used phrase in the USA until Iraq dictator Saddam Hussein uttered his famous line "The mother of all battles" shortly before the First Gulf War in 1991. **

7 January

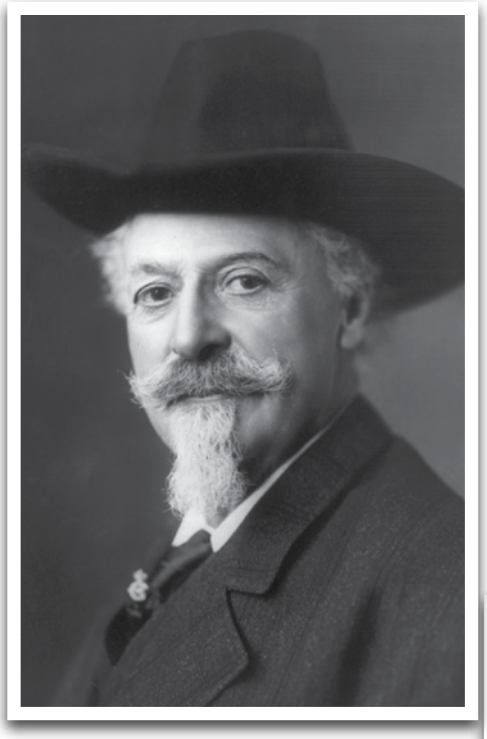
1953 President Harry Truman announced the U.S. has developed a hydrogen bomb (H-Bomb). He made this announcement in his final State of the Union Address.

8 January

1806 The Cape Colony became a British colony.

9 January

1920 The Human Fly (George Polley) attempts to climb to the top of the Woolworth Building in New York City (57 Floors). He reaches the 30th floor before being arrested.



10 January

1917 A Wild West legend, commonly known as Buffalo Bill, passed away on this day. He died in his sister's home in Denver. His real name was William F. Cody.

11 January

1569 England's first lottery was held on the steps of St. Paul's. It consisted of 400,000 lots at 10 shillings each.

12 January

1977 *"Ipi Tombi"*, a South African musical, opened at New York's Harkness Theatre.

13 January

1930 Mickey Mouse first appeared as a cartoon in USA newspapers.

14 January

1863 The Boston Weekly Journal became the first US newspaper to be printed on paper made from ground wood pulp.

15 January

1861 E.G. Otis was issued patent #31,128 for *"improvement in hoisting apparatus"* (aka safety elevator/lift).

16 January

1975 Angola achieved independence from Portugal.

17 January

1882 Leroy Firman received a patent for the telephone switchboard.

18 January

1943 A ban on the sale of pre-sliced bread was imposed in the USA. Metal was badly needed for everything from guns and tanks to ships, bombers, portable fighter plane landing strips, and docks.

19 January

1883 The first electric lighting system employing overhead wires, built by Thomas Edison, was brought into service at Roselle, New Jersey.

20 January

1857 William Kelly patented the blast furnace for manufacturing steel.

21 January

1981 Production of the iconic DeLorean DMC-12 sports car began in Dunmurry, Northern Ireland.

22 January

1970 The Boeing 747 makes its first commercial passenger trip to London, England. This flight had departed from New York City, and had carried 332 passengers and 18 crew.

23 January

1849 A patent was granted for an envelope-making machine.

24 January

1871 Charles Goodyear, Jr. patented the Goodyear Welt, a machine for sewing boots and shoes.

25 January

1881 Michael Brassill obtained a patent for a candlestick.

26 January

1875 The first electric dental drill was patented by George Green.

27 January

1880 Patent #223,898 was granted to Thomas A. Edison, for "an electric lamp for giving light by incandescence".

28 January

1807 London's Pall Mall became the first street lit by gaslight.

29 January

1895 Charles Steinmetz patented a "system of distribution by alternating current" (A/C power).

30 January

1969 The Beatles held their last public performance, on the roof of Apple Records in London. The police broke up this impromptu concert.

31 January

1893 COCA-COLA's trademark for "nutrient or tonic beverages" was registered. WN

** *http://www.ThisDayinQuotes.com/*

IN MY OPINION : SANDILE MAPHUMULO

Adapting to the Grid of the Future

The phrase "Smart Grid" has been bandied about the electrical industry for a number of years now. Quite often the question posed is, "has the electrical networks been dumb all along?" However, the smart grid refers to the modernising of the current electrical grid, through the integration of communication and information technology into the grid.

BY I SANDILE MAPHUMULO I ETHEKWINI ELECTRICITY

Improving the intelligence of the grid, and the role performed by communications, is further clarified by the IEEE ("A next generation electrical power system that is typified by the increased use of communications and information technology, in the generation, delivery and consumption of electrical energy") and NIST ("A modernised grid that enables bidirectional flows of energy, and uses two-way communication and control capabilities that will lead to an array of new functionalities and applications").

South Africa has acknowledged the need to modernise its grid, thereby harnessing the benefits of a Smart Grid. A national forum, South African Smart Grid Initiative (SASGI), was established in May 2012, with the objective of assisting in the creation of integration, co-ordination and finding alignment within South Africa on the principle of Smart Grid. This forum is championed by the Department of Energy through its implementation agent, the South African National Energy Development Institute (SANEDI). SASGI has developed a Smart Grid vision which will assist in paving the way towards a Smart Grid.

Is a Smart Grid realistic within the South African Context?

It is critical to pause a while and reflect on this important question, given the varied and numerous issues underpinning this the question: "Is a Smart Grid realistic within the South African Context given the many challenges within the industry?" These challenges, whilst not exhaustive, can be listed as follows:

- Supply constraints due to the increase in demand, and a static supply resulting in an eroding reserve margin over time;
- The current drive to ensure access to electricity for all households;
- A growing maintenance backlog resulting in an unreliable grid;
- Social issues due to the rise in theft of infrastructure and energy; and
- Skills shortage and requisite skills in critical areas.

Whilst these various challenges exist, there is still appetite within the industry to achieve a Smart Grid due to the following drivers:

- Greenhouse gas (GHG) reduction – 'As a responsible global citizen with moral as well as legal obligations under the UNFCCC and its Kyoto Protocol, South Africa is committed to

contributing its fair share to global GHG mitigation efforts. Accordingly, South Africa has committed itself to an emissions trajectory that peaks at 34% below a "Business as Usual" trajectory in 2020 and 40% in 2025, remains stable for around a decade, and declines thereafter in absolute terms'.

- Renewable resources – South Africa has committed to an energy mix by 2030
- Demand response – due to the supply constraints and the introduction of mandatory load shedding in 2008, significant focus has been placed on various initiatives to reduce load;
- Operational efficiency – utilities have to be more prudent in the management of its assets due to legislative requirements and financial limitations;
- Ageing workforce – there is natural attrition with little or no skills transfer, resulting in young staff with not much skill and experience;
- Customer satisfaction – the customers served by the utility has, over the years, become a more active participant coupled with the increasing demands;
- Power quality–the negative impact of poor power quality on the operations of the industry;
- Supply reliability–the growing demand by customers (residential, commercial and industrial) to ensure a reliable supply which continues to contribute to the stimulation of the economy; and
- Ageing infrastructure–inability to perform designed functions, increasing faults, greater maintenance and thereby hampering service delivery.

ETHEKWINI ELECTRICITY APPROACH

EThekwini Electricity has recognised the benefits of modernising its grid and therefore remains motivated and committed to achieving a Smart Grid. The benefits, in the main, include: (a) improved customer service, (b) network reliability, (c) improved outage response and (d) creation of an environment for innovation. In order to realise the objective of modernising its grid, eThekwini Electricity has adopted the approach as outlined below.

SMART GRID WORKGROUP

EThekwini Electricity has implemented, and is implementing, various projects with the aim of improving the smartness of the grid and managing the grid more effectively. The approach has been fragmented hence, the need to consolidate all efforts to achieve a common objective.

The need to consolidate all initiatives, and develop a common vision and strategy for the realisation of a smart grid, led to the establishment of a Smart Grid workgroup in May 2013.

The workgroup is constituted by a cross section of expertise from the organisation and is responsible for driving the achievement of a Smart Grid.

SMART GRID MATURITY ASSESSMENT

EThekwini Electricity recognised the need to determine its "as is" condition hence, resolved to undertake an assessment of the utility with regard to its Smart Grid maturity. The methodology used was via a model developed by the software engineering institute of the Carnegie Mellon University based in the United States of America. This model has worldwide recognition and has been utilised by numerous utilities worldwide.

The outcome of the assessment provided an independent view on the current maturity, and provided a platform to develop an improvement strategy.

SMART GRID STRATEGY DEVELOPMENT

The achievement of a Smart Grid can only be realised through a structured and co-ordinated approach via a roadmap. EThekwini Electricity is currently in the process of developing a strategy which takes into account the utilities overall strategy and the Cities smart vision.

ASSET MANAGEMENT

As a utility embarks on this journey towards achieving smartness of its grid, it's important to get the building blocks right. Fundamental to this is having an appreciation, as a utility, as to the ownership of its assets, their location and condition, and what is their remaining useful life. The utility has observed that the creation of a framework to manage and monitor the performance of these assets is key.

Over the past few years, eThekwini Electricity embarked on an asset field verification and identification initiative, which was primarily instituted to comply with GRAP17 financial regulations. However the exercise also enabled asset management fundamentals by providing reliable and detailed asset information. This information was captured and will be stored against an equipment hierarchy that will link the technical equipment register to the financial asset register.

COMMUNICATIONS INFRASTRUCTURE

In considering the role of communication networks in the smart grid, it's important to emphasize that the first enables the second. Adding intelligence to the electric grid primarily means automating various grid

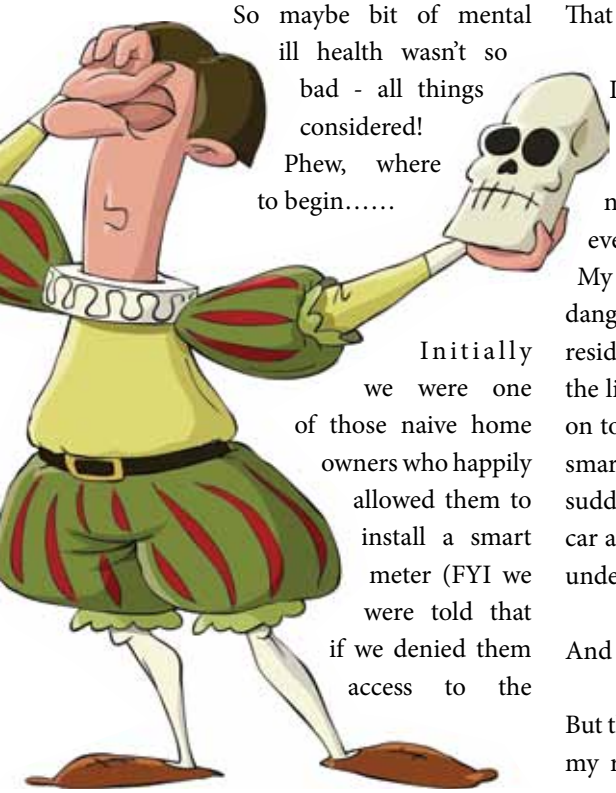
On the grid, off the grid

To be… or not to be…., that is the question. Just as I was contemplating getting 'off the grid' and negotiating the challenges of solar geysers, Eskom rebates and grey water recycling etc… the City of Johannesburg (COJ) somehow managed to sneak one past the goal posts.

BY I ANGELA PRICE

Contrary to their reputation for organized chaos, COJ went and implemented a whole new 'smart' initiative, using my suburb as their unsuspecting guinea pig. With very little notice/explanation or forewarning, we all had smart meters installed in our homes, a precursor to a national roll out (or so we were told) and forerunners in the drive to move onto a smart grid. The neighborhood went...MENTAL!!

According to a few local 'experts', who kindly took up arms on our behalf, those smart meters were going to incinerate our brains, give you all sorts of mysterious itches, rashes, brain tumors and sniffles. So maybe bit of mental ill health wasn't so bad - all things considered! Phew, where to begin……



Initially we were one of those naive home owners who happily allowed them to install a smart meter (FYI we were told that if we denied them access to the property we would have to pay thousands when they were rolled out nationally). So a smart black box, powered with cellular technology and complete with a handset (details to follow), sat on my kitchen wall blinking at me. The installer proudly told me how 'smart' this box was. A lot of scrolling through oddly named menu options would allow me to see my electricity consumption up to the minute, as well as my billing info. A user manual was promised but never materialized. The above mentioned handset was the trump card…apparently one of the cell phone networks would very soon bring the phones online and there would be the opportunity to have some very low cost/ free phone calls using the smart meter.
That phone never rang.

In the meantime my suburb had gone to war with the smart meter providers, and erupted into a newsworthy boiling pot, eventually even getting airtime on Carte Blanche. My inbox piled up with mails about the dangers of the cellular technology used, residents reporting mysterious ailments… the list and the emails went on. The cherry on top came when the radio frequency the smart meter service provider was using suddenly interfered with the frequency of car and gate remotes. We became a suburb under siege.

And still my 'smart' phone never rang….

But the meter did tick over and wonderfully my readings were communicated to City Power, literally with per second billing. No more reading my own meter and logging readings online, I liked this (but never admitted it to the activist residents).

A kitchen renovation saw the meter being re-installed in the garage where it lay forgotten, covered in dust. At some stage the relay communication between City Power and the smart meter also ceased. But not to be deterred, the service provider sent a car to cruise the suburb equipped with an individual hanging out of the window clutching what looked like a wire coat hanger - dutifully recording our relayed readings. And then that stopped too.

Just when I had forgotten about cell phone radiation and being on/off a grid - my hubby said, "Oh, some guy from City Power came today and installed a new smart meter'! So here we are, back at the beginning again. Whilst we have not had quite the same teething problems, we have yet to receive a bill from City Power with an actual meter reading, instead of an estimate. Seems these meters are very smart, they just don't communicate with City Power.

In the meantime City Power keep estimating wild readings with crazy electricity costs and, if I happen to fail to pay by just a few days, they send someone to cut me off - very promptly. They then sit on my money for a couple of months and every once in a while re-calculate it and credit my account - having earned some interest on my money in the interim. Now that is smart! wn

Adapting to the Grid of the Future

continues from page 61

functions. And automation isn't possible without communications networks that enable a two-way flow of data [3].

EThekwini Electricity has acknowledged the importance of communications, the backbone of the Smart Grid, and developed a communication network strategy. The communication network strategy is to establish a private, integrated multi-tier, hierarchical communication network. The system is required to cover the entire area of supply. It needs to be reliable, secure and scalable. As a modern communication network, it will be required to provide overall high bandwidth and low latency performance. To ensure efficient and effective operation and maintenance, the system will required to be fully manageable through a centralised management system.

With these fundamentals in place a utility can now begin to consider introducing smartness into the grid such as:

- Introduction of intelligent devices and sensors (automation);
- Installation of various communication mediums between onsite devices and the back-end (Control Centre);
- Modernised the metering infrastructure to enhance the customer experience; and
- Exploring different forms of generation and their impact on the grid.

DISTRIBUTION AUTOMATION

The long term goal of eThekwini Electricity is to obtain full Supervisory Control and Data Acquisition (SCADA) visibility throughout the distribution network. It therefore aims to install intelligent devices to remotely manage and control all medium voltage equipment in the distributor substations, ring main units, auto-reclosers, mini substations, and kiosks, to ensure network reliability. EThekwini Electricity also aims to install through-fault indicators to monitor the overhead infrastructure.

ADVANCE DISTRIBUTION MANAGEMENT SYSTEM (ADMS)

Controlling the network, and managing the people working on a power system, is fundamental to ensuring a safe and reliable power system. The ADMS being implemented by eThekwini Electricity delivers increased productivity and efficiency with active network optimization and control.

The ADMS delivers one network model, enabling integrated and streamlined operations, one user interface for an intuitive user experience, providing greater situational awareness and one system database that utilizes real-time network information that which spans high voltage to low voltage.

ADVANCED METERING INFRASTRUCTURE (AMI)

The AMI programme is responsible for the implementation of Smart Metering, which entails installation of smart meters, associated equipment such as communications modems, Customer Information Units and Data Concentrators, as well as Multi-Vendor Master Stations, and Meter Data Management System.

Integration of all these components will ensure a seamless end-to-end bi-directional communication flow.

This initiative, currently being rolled-out, will assist eThekwini Electricity in realising its broader objective of implementing a Smart Grid. It further assists in the monitoring and management of consumption by both the utility and the customer.

EMBEDDED GENERATION

EThekwini Municipality has come under tremendous pressure from the public, to introduce a mechanism to allow for the export of generated energy. Many installations have gone ahead without approval from the city and this has resulted in meters reversing, posing a severe financial risk to the municipality. Unknown reverse power flow also creates a safety hazard. If left unattended, the situation would become unmanageable.

In an effort to gain control and manage these installations better, eThekwini Electricity has taken bold steps in implementing an interim small scale embedded generation framework. Some of the steps taken include the proposed implementation of a residential embedded generation tariff to create a simple buy back mechanism for generated electricity.

DATA MANAGEMENT

Due to deployment of communication and information technology into the grid, this allows for the availability and visibility of various data and parameters from the field devices. In order to manage this sudden availability of data, eThekwini Electricity has recognised the need to develop a data management strategy. The strategy that governs organisation and control of the structure and design, storage, movement, security and quality of this data and information.

CONCLUSION

The journey is long, the challenges are many however, the enthusiasm, the will, the passion and the commitment is evident to achieve the objective of modernising the electricity grid in order to improve the provision of this current basic service to the customers. wn

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Design: Den Bromfield PIG