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THE OFFICIAL PUBLICATION OF THE SOUTH AFRICAN INSTITUTE OF ELECTRICAL ENGINEERS

ENERGY & EFFICIENCY

MARCH 2025

SAIEE

CONTENTS

SAIEE @SAIEE SAIEE

10 Industry News

20 Student News

26 Tertiary Education Facilities in South Africa

30 **Crossroads to net zero**
Choosing the optimal path to a Renewable Energy future

44 **Using Artificial Intelligence to Optimize the Flow of Energy through the Built Environment**
Managing the thermal equilibrium of a building using dynamic modulation

54 Legal Matters: POPIA's Direct Marketing Guidance Note

56 Opinion

62 History: Basil Schonland and Stanley Hey

64 SAIEE Membership

66 SAIEE Council

68 SAIEE Centres

69 SAIEE Events Calendar

Dear **watt**now reader

As we move through the first quarter of 2025 after a hectic start, our calendars are filling up with numerous industry events.

On page 5, you will find an invitation to the 2025 SAIEE Annual General Meeting, held at SAIEE House in Johannesburg on March 27th. This event will have a hybrid format; if you plan to attend in person, please inform my colleague, Ms. Gerda Geyer, for catering purposes.

This issue focuses on energy and efficiency. With the recent surprises of load shedding, we must pay attention to global power issues. The first feature article on page 30, "Crossroad to Net-Zero," evaluates two frequently considered pathways to achieve net-zero emissions in the global power sector. The findings suggest that balancing power plants with renewable energy and energy storage presents the most viable and cost-effective way to accelerate decarbonisation and reach net-zero.

The second feature article on page 44 discusses "Using Artificial Intelligence to Optimise the Flow of Energy through the Built Environment," highlighting practical applications of AI in this context.

This issue includes industry news, opinion pieces, and legal information to help you avoid violating the South African POPI Act.

The April issue will focus on Electrical Technologies, and the submission deadline is March 14th, 2025. Please email any contributions to minx@saiee.org.za.

Herewith the March issue; enjoy the read!

MANAGING EDITOR
M Avrabos

TECHNICAL EDITOR
J Buisson-Street

EVENTS
G Geyer

TRAINING ACADEMY
Z Sibiya

MEMBERSHIP
C Maseko

ADVERTISING
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SAIEE HEAD OFFICE
18A Gill Street, Observatory, JHB
T 011 487 3003
www.saiee.org.za
Office hours: 8am - 4pm

SAIEE 2024/5 OFFICE BEARERS
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Pascal Motsoasele
2024/5 SAIEE President

To the esteemed members of the SAIEE Council, Fellows, Senior Members, Members, Student Members, Associates, and future members of the Institute,

As my term as President of the SAIEE draws to a close, with the Annual General Meeting (AGM) on March 27th, 2025, I will hand over the reins to the President-Elect and our current Deputy President, Eng. Veer Ramnarain (Pr.Eng). I am filled with immense gratitude and pride. Serving as your President since April 2024 has been my honour, double privilege, triple pleasure, and a dash of humility.

Significant milestones have been marked this past year thanks to the unwavering dedication and hard work of our Council, Committees, Centres, Sections, Chapters, and staff. Together, we have navigated challenges and celebrated successes, always to elevate the SAIEE and contribute to the broader engineering landscape in South Africa.

KEY ACHIEVEMENTS AND INITIATIVES:

Inclusivity and Membership Growth: A pivotal decision was made to change the last "E" in SAIEE from "Engineers" to "Engineering" to be more inclusive to technologists, technicians, certificated engineers and artisans in the electrical engineering field. The Council approved the change, but we have not yet implemented it in our official documents and social profiles. This change underscores our commitment to inclusivity and aims to welcome a broader spectrum of electrical engineering practitioners into our ranks. On average, we have received more membership applications than resignations this year and graded more Senior Members and Fellows than any previous year.

Corporate Partnerships: Efforts were made to engage with corporations as diverse as Huawei and Sanlam, offering tailored sponsorship packages to foster mutually beneficial relationships across various economic sectors. I trust that that work will continue under the leadership of Mr Ramnarain. As the Immediate Past President, I will still be an Office Bearer and available for deployment to continue in that vein. One of the important engagements that was successful during the year is having brought Eskom back to paying for membership fees of their employees, not only for SAIEE but for all fraternal engineering voluntary associations. We also managed to sign up Old Mutual as a corporate partner. We will launch the SAIEE Financial Chapter on the 20 March 2025 to educate our young professionals and student chapter members about personal financial management. As part of its work programme, the Chapter will also look at assisting in establishing the SAIEE Benevolent Fund.

Marketing and Visibility: We have signed several Memoranda of Understanding (MoUs) with partners to enhance our membership value

E: president@saiee.org.za

ANNUAL GENERAL MEETING

27 March 2025 | 17h30
SAIEE House | JHB | Hybrid

SAIEE

The SAIEE President and Council invite members, guests and affiliates to the 2025 SAIEE Annual General Meeting.

Veer Ramnarain

INAUGURAL ADDRESS

REPOSITIONING THE SAIEE THROUGH STRATEGIC PARTNERSHIPS

In any organisation's journey, it is essential to reassess its growth trajectory periodically. This assessment helps determine the organisation's relevance in light of current dynamics. Often, this involves revisiting the founding members' vision to see if the organisation still holds significance today. The SAIEE has played a crucial role in engineering and education. We need to strengthen this relevance by collaborating with our strategic partners to meet our current members' expectations while also addressing future members' needs.

Veer has over thirty years of experience in the power generation, transmission and distribution industry, with most of the years at the Senior or Executive Management level. He is qualified with a BSc Electrical Engineering Degree, a Diploma in Engineering Business Management, a Master of Business Administration, and a Government Certificate of Competency. He is a Registered Professional Engineer with the Engineering Council of South Africa (ECSA). His industry influence has been at tertiary institutions and national and international professional bodies like ECSA, SAIEE, CIGRE, IEC, NRS, NECOM and AMEU. He is proud to be a Fellow and the incoming President of the South African Institute of Electrical Engineers.

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SAIEE House
18A Gill Street, Observatory, JHB

RSVP PHYSICAL ATTENDANCE
Gerda Geyer
geyerg@saiee.org.za by 20 March 2025

 continued from page 5

proposition in job recruitment and marketing. Notably, we signed an MoU with KPR, a specialist engineering recruitment company that has advertised positions on social media and other platforms and widely promoted the SAIEE brand in the industry.

Technical Partnerships: The SAIEE continues to partner with tertiary institutions to deliver the annual SAUPEC conference. This year, SAUPEC 2025 was hosted by the Tshwane University of Technology (TUT) and held at Irene in Centurion – I was honoured to deliver the opening address. We have also hosted the IEEE Wireless Africa Conference in Pretoria, thus exercising the MoU between the SAIEE and the IEEE. We have also signed an MoU with the South African Council for Automation and Control (SACAC) to collaborate on technical engineering matters of mutual benefit; we will be co-organising a control and automation workshop in July 2025, and I will be delivering a guest lecture to the SACAC audience on the 9th of May 2025.

Active Citizenry: This year, the SAIEE adopted a stance to be more visible participants within our area of expertise, electrical engineering. We offered our input on Eskom's multi-year price determination 6 (MYPD6) application. Although not everyone was happy with our submission, at least we provided a submission. I trust this marks a new era where we will no longer resign ourselves to being passive observers on matters within our technical realm.

Promoting STEM and Outreach: A key focus has been empowering the next generation of SAIEE members by promoting STEM subjects in schools and tertiary institutions. Various Sections, Chapters, and our regional Centres have organised activities around this theme. Most notable are the numerous **watt**now articles and social media posts showcasing the great work done by Centres such as the Free State Centre, KwaZulu Natal Centre and Central Gauteng Centre, reaching out and promoting the SAIEE's social responsibility initiatives while partnering with the likes of Cigre, ECSA, CBE, Eskom and Transnet Young Professionals and other like-minded organisations. Special mention goes to the Eastern Cape Centre, which hosted its third regional conference in January. KZN Centre organised an engineering leadership conference in 2024, although I can't be sure if this was their first regional conference. Big Thumbs-up to the Centres!

Engagement and Communication: Regular interaction with members was promoted through the president@saiee.org.za email address. This was established to maintain open and transparent communication with the SAIEE President, address member concerns, and foster a sense of community. I trust that members will continue to use this platform to bring their concerns and/or input and suggestions to the attention of the SAIEE Council.

Events and Lectures: Successful events such as the President's Invitation Lecture, featuring Ms. Nomso Kana, and the Bernard Price Memorial Lecture, featuring Prof. Vukosi Marivate, provided invaluable networking and knowledge-sharing opportunities. We strive to bring our members thought-provoking lectures with relevant technical content and debate. I hope we can improve the number of industry site visits so that our wider membership is at the same level or better than in the pre-COVID days.

Collaboration and Recognition: The SAIEE is celebrating the election of our fellow SAIEE member, Eng. Refilwe Buthelezi PrEng, as the 6th President of the Federation of African Engineering Organisations (FAEO). She is the current President of ECSA and a former member of the SAIEE Council. This is a testament to the calibre of engineering practitioners we produce; we trust that she will represent us well on the global stage. Some of our members have also been roped in to serve within the structures of the FAEO. I will serve as the first chairman of the newly established FAEO Governance Committee, reviewing and resetting its constitution, policies and bylaws, and policing compliance. I shall attend Refilwe's inauguration as FAEO President on the 4th of March 2025 in Gaborone, Botswana.

The SAIEE Annual Awards, scheduled for March 14th, 2025, is fast approaching. It is encouraging to learn that we are already fully booked. This year, we

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 continued from page 5

expect several industry captains; you may never know whose attention you might catch when networking in a relaxed social environment.
I am looking forward to hosting you!

To the SAIEE Council Committees, the Committee Chairs, Sections, and Chapter Chairs, I thank you for your service. I have no illusions about the difficulty of my job as President without your support. Please continue to rally behind the incoming President as you have done for me.

To the Centre Chairs and your Centre Committee members, your efforts to promote this 115-year institution and its ethos established over the years are commendable, and so, too, is the drive to establish student chapters in your regions. Please continue to serve our members well while growing the membership. We hope to realise and reap members from your Centres that will go on to serve on Council and other structures of the Institute, upgrade to the Fellow grade, and eventually be elected to being Office Bears and, dare I say, President of the SAIEE!

To the Student Chapter leadership and the student members, this is your home. You are a beacon of hope for the propagation of this great Institute for a further 115 years. Leverage the generational wisdom embedded within the wider membership. You have access to mentors and career coaches within this Institute, waiting for you to reach out. You may not see it right away, but the resources of this Institute are geared towards your professional success. Dare I say, the god of Engineering has great plans for you. Keep resolute about your resolve to become an engineering practitioner; it's a rewarding career! Remember to upgrade your membership from Student Member to Member when you graduate.

To the SAIEE staff, your consistent efforts throughout the year have ensured the smooth running of our operations. Yes, it hasn't been an easy year. We have even lost some members to resignation, most notably our accountant. Your diligence and professionalism are truly commendable, and I encourage you to continue in the same vein going forward.

Thank you again for allowing me to serve as your President. It has been a privilege to work alongside each of you, and I look forward to witnessing the continued success and growth of the SAIEE in the years to come.

Pascal Motsoasele
SAIEE President

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Driving efficiency and sustainability

2025 Wireless Africa Conference huge success

The 2025 Wireless Africa Conference, held from February 24 to 25, 2025, was a groundbreaking event that gathered some of the brightest minds in wireless technologies. The IEEE Vehicular Technical Society (VTS) partnered with Sentech and the South African Institute of Electrical Engineers (SAIEE) to facilitate discussions between industry experts and academic leaders about the future of wireless technologies in Africa.

"The Wireless Africa Conference was launched to create a platform in Africa where professionals from various sectors—academia, industry, and government—can come together to present the latest research, exchange innovative ideas and experiences, and explore networking and collaboration opportunities," stated Mr. Gerhard Bauch, VTS President.

This conference, hosted for the second time in South Africa by the Sub-Saharan IEEE VTS Chapter, has grown significantly since its inception in 2018.

The esteemed Future Africa campus at the University of Pretoria hosted the conference, which became a hub for cutting-edge research and development in wireless technologies. Scholars, researchers, and government representatives presented various papers.

Prof. Fambirai Takawira, the Technical Chair for the 2025 WAC, mentioned, "The IEEE WAC is the only conference on the African continent that focuses solely on wireless communications. It encompasses all facets of technologies, applications, and services related to wireless communications, including terrestrial and satellite wireless communications and vehicular communications.

The conference program featured three keynote speeches, two panel discussions, and six sessions dedicated to peer-reviewed technical papers. Four invited talks were presented by Sentech Collaborative Research Network researchers, showcasing some of the research being conducted at South African universities. The conference also included an Industry Round Table discussion addressing a relevant technology and policy issue."

Prof Sunil Maharaj, 2025 WAC General Chair, concluded: "The effort and expertise invested by the Organising Committee in bringing together the who's who in wireless technology is sincerely appreciated, as is the excellent support provided to the conference by local, African and international experts. Special recognition is due to the Technical Programme Committee Chairs and Co-Chairs, our Finance Chair, VTS staff, SAIEE and our industry sponsor, Sentech Pty Ltd, for going above and beyond to ensure the conference's success.

The 2025 WAC Organising Committee wishes to thank our Platinum Sponsor, Nokia, for their support, and all the volunteers for their tiresome work ensuring this event went off without a hitch. The next Wireless Africa Conference is scheduled for 2027—stay tuned for more updates.

Click here to download the technical program. wn

2025 Wireless Africa delegates, organisers and presenters.

Gösta Kallner, Executive Chairman at 450 MHz Alliance, Sweden.

From left: Prof Sunil Maharaj, Filip Paluncic, Leanetse Matutoane), Dumisa Ngwenya, Gerda Geyer, Minx Avrabos, Cerry Leffler and Gerhard Bauch.

From left: Albert Helberg, Filip Paluncic, Albert Lysko and Joyce Mangwana.

From left: Nomvuyiso Batyi and Melvin Ferreira.

From left: Mervyn Ferreira, Johan Blackie, Albert Helberg, Andries Oelofse and Simbarashe Ngorima.

The IEEE VTS Team, from left Cerry Leffler and Gerhard Bauch, VTS President.

2025 Wireless Africa delegates getting ready for the Gala dinner.

The SAIEE organising team, from left: Minx Avrabos, Leanetse Matutoane and Gerda Geyer.

SAIEE hosted its partner's evening in Melrose Arch

Nomsa and Pascal Motsoasele (SAIEE President).

The South African Institute of Electrical Engineers (SAIEE) recently held a special Partners Evening at the Grillhouse Melrose Arch to thank council members and their partners for their dedication and service.

The event, which took place in the heart of Johannesburg, was a night filled with networking and delicious food. SAIEE President Pascal Motsoasele thanked the council members and their partners for their hard work and commitment to advancing the field of electrical engineering in South Africa.

"It is thanks to the tireless efforts of our council members's partners that SAIEE continues to thrive and positively impact the industry," said Motsoasele. "I thank the partners who support our council members during their service, and the SAIEE is incredibly grateful for everything they do."

The evening allowed council members and their partners to relax and enjoy each other's company outside the usual work setting. It also allowed them to connect with other industry professionals and build valuable relationships. wn

ABB technology powers three substations in Uganda

Uganda is renowned for its diverse landscapes, including the snow-capped Rwenzori Mountains, expansive Lake Victoria, and abundant wildlife. In 2024, ABB delivered solutions for three substations run by the country's leading utility, Umeme Limited (UMEME), which manages and operates the state-owned leased electricity distribution network assets.

"Since 2005, we have been working in Uganda to strengthen the country's power distribution network, providing electricity to commercial and residential establishments," said Gunasekaran Thevar, Managing Director of East Africa for ABB Energy Industries. "These new projects will further enhance our support for Uganda's utility sector."

ABB's technology solutions are helping to deliver a reliable and efficient power supply, fueling economic growth and drawing in new investments.

POWERING UP

A robust power infrastructure is crucial for continued economic growth. These projects are part of a broader initiative to improve the country's electrical infrastructure and power distribution. The ABB-built substations will help address capacity constraints and ensure a more reliable power supply.

As part of this project, ABB upgraded the 33/11 KV substation in Hoima, located in the Bunyoro region, with gas-insulated switchgear, a substation SCADA system and a DC charger system. Bunyoro's oil industry is centred around the Albertine Basin in Uganda, which possesses significant oil and gas deposits.

This draws attention and investment and is leading to various infrastructural developments.

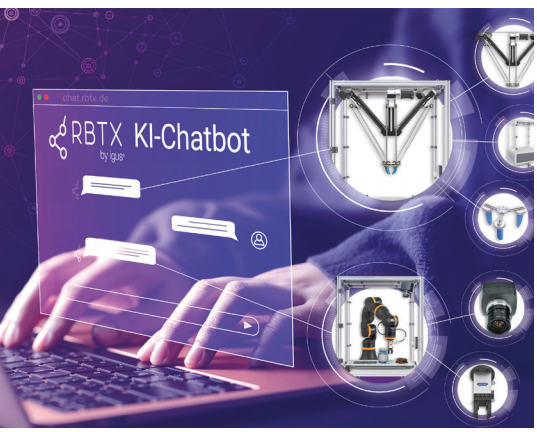
"The upgraded Hoima substation will support Bunyoro's developing oil industry, added Gunasekaran Thevar. "We completed the project in a short timeframe, airlifted the ABB switchgear and installed it at the substations to promptly meet customer requirements." ABB also constructed the Jinja and Matugga substations to meet regional power needs.

LONG TERM BENEFITS

An efficient power distribution network supports growth, development and improved living standards. ABB's solutions at the three substations will enhance reliability and productivity while reducing power outages, allowing businesses and households to operate with uninterrupted electricity that will improve quality of life, attract investment, facilitate technological advancements and boost economic growth.

"ABB has been a crucial partner in supporting our utility sector," said Selestino Babungi, Managing Director of UMEME. "The substations powered by ABB's solutions will enable us to supply electricity to surrounding areas and enhance Uganda's overall economic activity." wn

New AI advisor for robot selection



An interactive AI advisor from German manufacturer igus uses application databases to shorten the time spent looking for components when building cost-effective robot systems.

Igus's new AI chatbot has been added to the online platform RBTX.com. The interactive consultant is designed to enable companies with little previous experience and technological expertise to quickly and reliably create Low-Cost Automation (LCA) solutions to become more competitive. First, users are enthusiastic about the intuitive AI solution.

"Many companies already know that automation offers enormous potential for meeting the challenges of a rapidly changing working world. However, the crucial question remains: how do you implement them?

"RBTX provides the answer: there are over 500 robot solutions online. Companies without robotic knowledge can develop cost-effective LCA solutions using the plug-and-program principle.

"With RBTX, we want to eliminate all the barriers that stand in the way of companies entering the world of automation - step by step," says Alexander Mühlens, Vice President and Head of Business Unit: Low-Cost Automation at igus.

The decisive factor here, for example, is to ensure guaranteed interoperability of all the components we offer, which makes it virtually impossible to make the wrong purchase. "A further step in this direction is the introduction of a new AI advisor that interacts with interested parties to reduce the time they spend searching for components in a range that keeps growing."

The new AI chatbot supports multiple languages and, although still in the launch phase, can be used with igus South Africa's robotics buying pages, where users can match suitable LCA components through written interaction.

The AI draws on empirical data from hundreds of projects that companies have already successfully automated with the help of RBTX. The answers are correspondingly targeted. For example, a small workshop suffering from a labour shortage would like to automate the loading of its CNC machine with blanks.

The company's technical manager called up the new AI chatbot and asked, "Which robot is suitable for loading my CNC machine?" Within a few seconds, the AI answers: "The robolink robot arm from igus would be a suitable solution here. The arm moves along five axes, has a reach of 790mm, a speed of seven picks per minute and can detect the position of the components using a 3D camera. After this answer, the user asks which gripper would work. The AI consultant replies: "A parallel gripper from Zimmer would be a suitable choice." Users gradually put together their own LCA solution in this seemingly natural dialogue.

Companies experimenting with automation are enthusiastic about the new AI chatbot. "Many customers have already given us feedback that they have entered into a dialogue with the AI robot advisor. It has given them a better feel for the possibilities of LCA and significantly accelerated the search for suitable components." wn

COMTEST GROUP CELEBRATES 20 YEARS!

It is said, "Time flies when you're having fun!" and so it seems to be for The Comtest Group of Companies (established in 2005), which is proudly celebrating 20 years of successful trading in the Southern African test and measurement, communications, equipment, solutions, and specialised systems markets.

In 2005, COMTEST was appointed Fluke's Master Distributor for Southern Africa. Over the intervening years, numerous corporate awards followed, and many other manufacturers have allied with Comtest. It has also forged alliances with leading international companies.

COMTEST represents the following international test and measurement companies: BEHA-AMPROBE, BK PRECISION, FLUKE, FLUKE CALIBRATION, IET LABS, FRANKLIN, MERIAM, MICROSEMI, MIDTRONICS, PICO TECHNOLOGIES, and RADIAN RESEARCH.

Comtest acquired INSTROTECH (EST. 1981) in November 2010. Instrotech is a supplier of high-quality process control instrumentation and industrial electronics and a leading producer of weighing electronics, signal conditioners, process calibrators, and digital display units with worldwide sales.

Instrotech also imports instrumentation with distribution rights for reputable international partners and leading brand products, including ELIS, KELLER, KOBOLD, LR-Cal LTR, MICHELL Instruments, MONITRAN, OPTRIS, SIKO, SCANCON, SELET, SEMNIX, SENSOR TECH, and VISHAY VPG Transducers.

Barend Niemand, COMTEST GROUP CEO, says, "It's been a wonderfully exciting ride from the start! I can hardly believe we are in our 20th year – 20 years of innovation, hard work and achievement. The Comtest Team's dedication and perseverance has resulted in growth and success. Above all, our commitment to quality and customer satisfaction has brought us to this impressive milestone. I want to thank our suppliers, industry and customers for their ongoing support, making this possible."

"On a personal note," he added, "I am truly privileged to have worked alongside my Executive team, comprising Jannie Dirks, Sales Director; Eduard Arnold, Financial Director; Pieter Deysel, Technical Director; and Hugh du Plessis, R&D Director.

My management style is "Open Door" and participative, where staff are included in decision-making, and their input and ideas are encouraged. Comtest People are encouraged to self-manage and foster teamwork."

"And so, in conclusion, I want to thank each and every member of staff for their contribution to Comtest's success. These innovative people have continuously reinvented themselves to develop new strategies to meet the challenges of ever-changing markets.

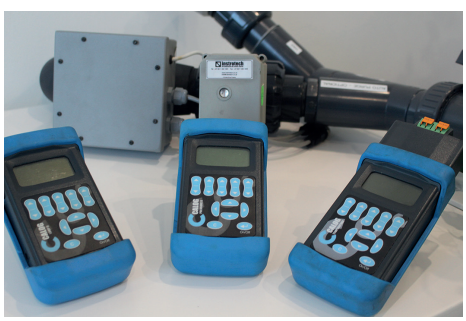
The future holds exciting promise as we continue to trade actively throughout Southern Africa, with an eye on generating more export sales to Europe and beyond."

Comtest's vision includes adding new products to its manufactured range and acquiring new companies aligning with its core business focus. wn

From left: Founding shareholder, Peter Verwer; North Star's Mike Wietzoorek; Comtest Group CEO Barend Niemand; Comtest Technical Sales Support, Gareth Smith; Comtest Group Technical Director, Eduard Arnold; and Hilton Preston, Founding Shareholder.

COMTEST's anchor brand FLUKE

COMTEST's most valued asset, THE STAFF.



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VIDEO LINK

JA Solar Collaborates with ARTsolar

JA Solar, a globally acclaimed photovoltaic (PV) module manufacturer and the leader in solar module shipments in Africa has entered into a strategic partnership with ARTsolar, South Africa's premier local PV module manufacturer. This collaboration underscores JA Solar's commitment to driving renewable energy adoption across Africa while promoting local production and economic development in South Africa.

ADDRESSING SOUTH AFRICA'S ENERGY NEEDS WITH LOCAL SOLUTIONS

The partnership is aligned with the South African Department of Mineral Resources and Energy's (DMRE) Risk Mitigation Independent Power Producer Procurement Programme (RMIPPPP). It aims to capitalise on future opportunities within the country's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP). These initiatives are crucial as South Africa leads the continent in total installed solar gigawatts, a testament to the country's proactive embrace of renewable energy.

JA Solar's collaboration with ARTsolar combines global expertise and local innovation to produce high-efficiency locally large-format PV modules. By investing in South Africa's renewable energy infrastructure, the partnership addresses the growing demand for clean energy while fostering a self-reliant solar manufacturing ecosystem.

STRENGTHENING LOCAL MANUFACTURING CAPABILITIES

ARTsolar, founded in Durban in 2010 by entrepreneurs Eshu Seevnarayan, Patrick Goss, and Nhlanhla Zondo, is a 100% South African-owned company with a longstanding reputation in PV manufacturing. Through this partnership, ARTsolar has upgraded its facilities to a cutting-edge 340MW solar PV panel manufacturing plant, significantly enhancing its production capacity.

The upgraded facility will support manufacturing high-quality JA Solar modules, meeting international standards while catering to local market needs. This initiative reduces reliance on imports and boosts South Africa's localisation efforts in the renewable energy sector.

"With this collaboration, we can offer South Africans an enhanced range of high-quality, locally produced PV modules," said a JA Solar spokesperson. "Our goal is to support local manufacturing, create jobs, and drive technological transformation in the region."

DRIVING ECONOMIC GROWTH AND JOB CREATION

The partnership between JA Solar and ARTsolar will strengthen South Africa's renewable energy infrastructure and create significant economic benefits. ARTsolar has invested heavily in technical training and skills development, collaborating with tertiary institutions to build a skilled workforce.The new facility is expected to create 150 permanent jobs, bolstering local employment and economic activity. This aligns with the government's focus on industrialisation and job creation while positioning ARTsolar as one of Africa's leading and only African-owned PV manufacturers.

Eshu Seevnarayan, Chairman of ARTsolar, expressed optimism about the partnership, stating, "As proud industrialists, the renewed focus on local PV manufacturing has brought a much-needed resurgence of hope for renewable energy and local industries. For 14 years, we have trusted in and anticipated this commitment from the government."

REINFORCING JA SOLAR'S LEADERSHIP IN AFRICA

This partnership further solidifies JA Solar's leadership in solar module shipments across Africa. With South Africa spearheading the continent's renewable energy transition, this collaboration strengthens JA Solar's leadership in Africa and enhances its role in the continent's renewable energy transformation.

South Africa's rich natural resources and supportive policies, including a competitive tariff-based bidding system under REIPPPP, make it a strategic hub for renewable energy growth. JA Solar's investment in local production underscores its dedication to sustainable development and economic empowerment in Africa.

A BRIGHTER FUTURE FOR RENEWABLE ENERGY IN AFRICA

This partnership represents a significant step toward meeting South Africa's energy needs through locally manufactured, high-efficiency PV modules.

By combining JA Solar's global expertise with ARTsolar's local manufacturing capabilities, the collaboration sets a precedent for sustainable growth, technological advancement, and economic empowerment in Africa's renewable energy sector.

As JA Solar continues to lead the way in solar innovation, this partnership reaffirms its vision of a greener, more sustainable Africa powered by locally produced clean energy solutions. wn

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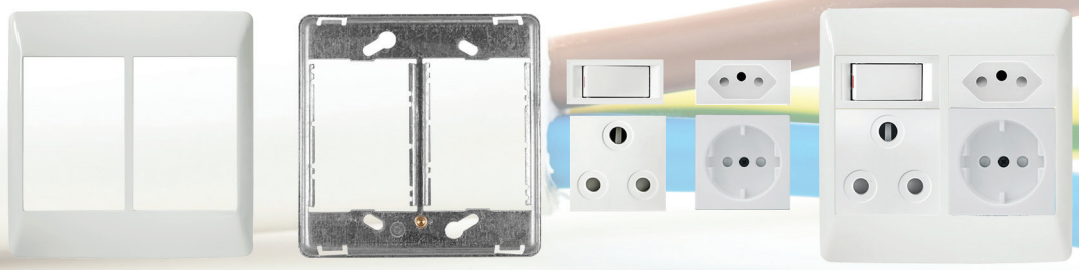

The Diamond range has a modular design which allows you to interchange switch modules and coverplates to suite your electrical installation requirements.

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Why Engineering Students should join the SAIEE

Engineering students in South Africa are highly encouraged to consider joining the South African Institute of Electrical Engineering (SAIEE). This prestigious organisation offers numerous benefits that significantly enhance their academic and professional development.

ABOUT THE SAIEE

Formed in 1909, the SAIEE has ±6000 members professionally engaged in various engineering activities, including academic research, manufacturing, electronics, telecommunications, measurement and control, mining, and power infrastructure services. Members make meaningful contributions to the quality of life in communities and the steady advancement of technology. Their efforts are acknowledged in many countries worldwide.

One key advantage of joining the SAIEE is access to a network of experienced professionals in the engineering field.

As members, engineering students have the opportunity to connect with industry experts who can provide valuable mentoring and career guidance. These connections can help students gain insights into the latest trends and developments in the industry, as well as potential job opportunities and internships.

Furthermore, SAIEE membership provides exclusive events, workshops, and seminars tailored to help engineering students enhance their skills and knowledge.

These events offer valuable opportunities for students to learn from experts in the field, collaborate with peers, and stay updated on the latest advancements in engineering.

The SAIEE Student membership is free from 1 December 2024, and with that, the SAIEE Student member (StM) receives the following benefits:

- **Jobs portal for WIL**
  SAIEE Student Members receive preferential placing for their Work Integrated Learnership (WIL) with our SAIEE Corporate Partners
- **Mentorship**
  The SAIEE has a cohort of mentors who are willing and eager to assist our student members with their studies and career guidance
- **Exclusive Networking Events**
  StMs attend all SAIEE events for free and are exposed to industry decision-makers
- **CPD training discounts**
  To maintain your continuous development, the StM receives significant CPD training discounts
- **Charge Reward Programme earnings**
  As a StM, when attending SAIEE events, you earn Charge Reward Points, which can be claimed against paying for training courses, etc.
- **Bursary programme**
  StMs receive preferential treatment when they apply for a SAIEE Bursary
- **Publication access**
  Student members have access to all SAIEE publications since its inception in 1909, which include the monthly online wattnow magazine and the peer-reviewed Africa Research Journal
- **Site visits**
  SAIEE Student members are invited to site visits free of charge, which is CPD accredited, where you can learn hands-on how manufacturing facilities operate
- **SAIEE Centres**
  SAIEE has nine centres nationwide, and we encourage students to get involved at their local SAIEE Centre and represent your student chapter on the Centre EXCO committee.

The South African Institute of Electrical Engineering is a valuable investment for students from all engineering disciplines and tertiary establishments who are serious about advancing their careers in engineering. To learn more about joining the SAIEE, click here. wn

Serving Since 1909

Formed in 1909, The South African Institute of Electrical Engineers sports ± 6000 engineering professionals.

Why Join Us

Our members are professionally engaged in various engineering activities, including academic research, manufacturing, electronics, telecommunications, measurement and control, mining, and power infra-structural services. Members make meaningful contributions to the quality of life in communities and the steady advancement of technology. Their efforts are acknowledged worldwide. Join us today and start making a difference!

Student Bursaries

Our bursaries are for candidates who have completed a first-year study for a degree or diploma in Electrical, Electronic or Computer Engineering at an accredited South African tertiary institution.

Skills Development

One of our core objectives is to harness and foster the growth of students to study Science, Technology, Engineering, and Mathematics (STEM) subjects.

Student Activities

Becoming involved in a Student Chapter and participating in meetings can teach a student member valuable business skills. SAIEE offers mentorship, coaching and vacation work.

SAIEE

Our Purpose

To enhance the practice of electrical engineering in South Africa and the stature of our members through knowledge, networking, influence, education and communication.

Contact Us

SAIEE House, 18A Gill Street, Observatory, JHB

011 487 3003

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CUT SAIEE Student Chapter Steps Up to Support Registration at FEBIT

At the Central University of Technology (UCT), Freestate SAIEE Student (SC) Members have taken on an important role in assisting new students with registration in the Faculty of Engineering, Built Environment, and Information Technology (FEBIT). Introduced in 2023, this initiative began as a collaborative effort to streamline the registration process.

Recognising the students' effectiveness, the faculty head, Mrs Mpho Mbeo and the acting Head of Department (HOD), Dr B Kuriakose, recently decided to make their involvement a regular feature of registration periods.

The faculty head and the acting HOD have expressed admiration for the dedication and effort demonstrated by the CUT SAIEE SC, whose contributions have significantly improved the overall efficiency of the registration process. This initiative has benefited the university by providing valuable support and created a unique opportunity for CUT SAIEE SC to promote their organisation. By engaging directly with new students, faculty staff, and other campus students, the students can raise awareness about their organisation's mission and activities.

Beyond assisting with registrations, this initiative has enabled CUT SAIEE SC to recruit new members, further strengthening their organisation. As a full expression of appreciation for their commitment, the faculty head also invited the CUT SAIEE SC to attend the first-year orientation, where they had the opportunity to interact with new students and introduce them to the organisation.

By playing a vital role in the university community, the students showcase leadership and teamwork while making a positive impact on campus life—a testament to their dedication to both academic and organisational excellence. wn

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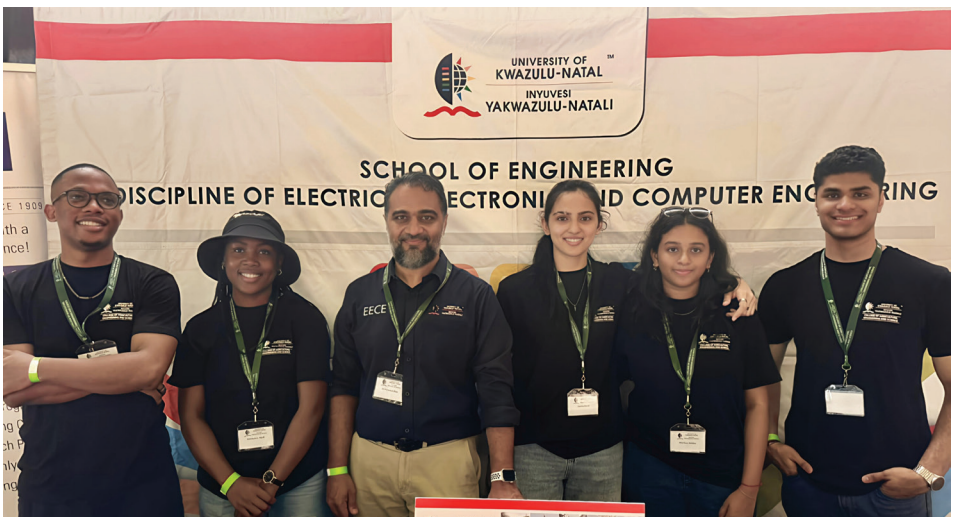
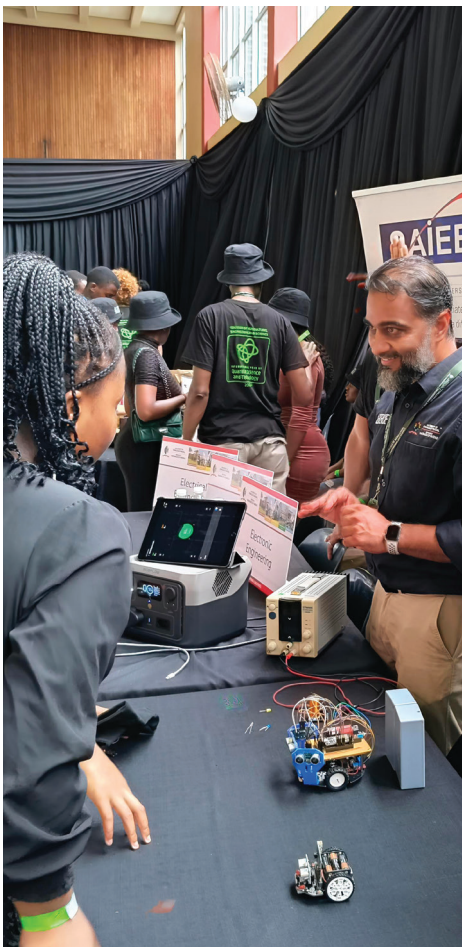
SAIEE UKZN Student Chapter at the First-Year Meet & Greet



From left: Ntuthuko Zulu, Nombulelo Ngidi, Dr Mohamed Fayaz Khan, Saaliha Paruk, Shankara Naidoo, and Mihir Singh.

On 22 February 2025, the SAIEE UKZN Student Chapter set up a stand at the First Year Experience Meet & Greet, giving first-year students a proper introduction to Electrical, Electronic, and Computer Engineering (EECE).

With a hall full of different clubs and societies, we represented both SAIEE and the EECE discipline, showing students some of the projects they worked on within the school. Instead of just talking about engineering, we demonstrated it—explaining how different systems work together, answering technical questions, and giving first-years a clearer idea of what studying EECE involves.



More than just a showcase, this was about making first-years feel welcome and helping them navigate the start of their university journey. Many of them had questions about courses, workload, and what to expect, and we offered advice where we could. With over 380 students attending, there was no shortage of curiosity, and it was great to see so many engaging with the discipline. For us, the event was a chance to connect with the next group of engineers and let them know they have a community to turn to. wn

A single flaw can break an entire system

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Corporate Partners are invited to monthly forum meetings to discuss and brainstorm critical issues in South Africa and find solutions.

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- Mentorship
- Offering SAIEE Students Workbased Integrated Learning (WIL)

Our Purpose

To enhance the practice of electrical engineering in South Africa and the stature of our members through knowledge, networking, influence, education and communication.

SAIEE Company Profile

SAIEE

Contact Us

SAIEE House, 18A Gill Street, Observatory, JHB

minx@saiee.org.za

www.saiee.org.za

Unlocking Africa's Digital Future

SENTECH ACADEMY, 5G CONNECTIVITY, AND CLOUD SOLUTIONS

In the heart of South Africa's dynamic technological landscape, a transformative initiative has emerged, poised to bridge the critical digital skills gap, enable cutting-edge connectivity, and empower businesses to embrace the cloud revolution. Sentech, with a proud legacy in signal distribution and digital content delivery, is uniquely positioned to enhance South Africa's digital skills landscape through its additional strategic technological offerings, Sentech Academy, 5G Connectivity, and the Sentech Cloud Delivery Centre.

SENTECH ACADEMY:

EMPOWERING AFRICA WITH DIGITAL SKILLS

Africa is at a critical crossroads, where digital transformation holds the potential to fuel economic growth and innovation. However, a lack of accessible digital skills remains a barrier to realising this promise. The Sentech Academy for Emerging Technologies and Innovation (SAETI) is a game-changing educational platform designed to democratise access to essential digital skills and empower individuals across South Africa to thrive in the digital economy.

A Vision for a Digitally Connected Africa

Africa is at a pivotal moment in its history, with the potential to harness technology to drive sustainable growth and create opportunities.

However, a significant barrier stands in the way: the lack of accessible digital skills. SAETI, commonly known as Sentech Academy, addresses this challenge head-on, equipping individuals with the tools and knowledge required to succeed in rapidly evolving industries.

The academy offers a blended learning model, combining self-paced online courses, live virtual classrooms, virtual labs, and hands-on projects to ensure flexible and comprehensive learning. With over 300 courses and 35 role-aligned learning paths, learners can delve into key fields shaping the global economy, including:

- Artificial Intelligence (AI)
- 5G Technology
- Data Science
- Cybersecurity
- Internet of Things (IoT)
- Edge Computing
- Software Development
- Cloud Computing

Through its focus on accessibility and cutting-edge technology, SAETI ensures that even underserved and remote communities have access to world-class digital training.

This initiative is more than just an educational platform it's a catalyst for building Africa's future digital leaders.

SENTECH 5G CONNECTIVITY:

TRANSFORMING COMMUNITIES AND BUSINESSES

As a pioneer in connectivity solutions, Sentech is harnessing the transformative power of 5G technology to enable faster, smarter, and more reliable networks across South Africa. The organisation's focus on 5G verticals, including Fixed Wireless Access (FWA), Internet of Things (IoT), and Private 5G Networks addresses the diverse needs of businesses, industries, and communities.

Key Offerings of Sentech 5G Connect Solutions:

- Fixed Wireless Access (FWA): Affordable and reliable high-speed broadband access for underserved peri-urban areas, eliminating the complexities of fiber deployment.
- IoT Solutions: Seamlessly connect and manage devices and sensors through private 5G networks, enabling real-time insights and operational optimisation.
- Private 5G Networks: Dedicated, secure, and low-latency networks designed for mission-critical applications in industries adopting Industry 4.0.

Sentech's smart community initiatives leverage 5G and IoT to transform rural areas into efficient hubs, enabling automated meter readings, real-time utility monitoring, and faster response to outages. These advancements unlock opportunities for economic growth while bridging the digital divide.

SENTECH CLOUD DELIVERY CENTRE:

REVOLUTIONISING CLOUD SERVICES

As organisations embrace digital transformation, the Sentech Cloud Delivery Centre offers robust, scalable, and secure cloud solutions to help businesses optimise operations and innovate with confidence.

By transitioning from on-premises systems to the cloud, companies gain access to benefits like cost savings, scalability, and enhanced security. The Sentech Cloud ecosystem enables businesses to focus on their core strengths while leaving infrastructure management in expert hands.

Our Cloud Services Include:

- Infrastructure Services: Reliable and scalable cloud infrastructure to support your digital needs.
- Solution Services: Tailored cloud solutions for unique business challenges.
- Professional Services: Expert consulting, migration, and cloud optimisation.
- Training and Certifications: Equip teams with the skills needed to manage and innovate with cloud technologies.

Sentech's cloud solutions empower organisations with agility and global reach while ensuring top-tier data security, automatic updates, and disaster recovery.

PARTNER WITH SENTECH TO SHAPE AFRICA'S DIGITAL FUTURE

Through its Academy, 5G connectivity, and cloud solutions, Sentech is not just offering services, it is building the foundation for a digitally empowered Africa. Whether you're an individual looking to upskill, a business seeking advanced connectivity, or an organisation ready to embrace the cloud, Sentech is your partner for success. wn

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Crossroads to net-zero

- CHOOSING THE OPTIMAL PATH TO A RENEWABLE ENERGY FUTURE

This report evaluates two commonly considered pathways to achieve net-zero emissions in the power sector at a global level. The findings indicate that combining balancing power plants with renewables and energy storage offers the most viable and cost-effective pathway to accelerate decarbonisation and achieve net zero.

Given the urgency of coordinated global action to achieve net zero by 2050, achieving greater alignment on the most effective pathway to decarbonisation targets is essential for meaningful progress. To support this goal, Wärtsilä initiated a global power system modelling analysis to evaluate the impact of widely discussed decarbonisation pathways.

This report evaluates two pathways to achieve net-zero emissions in the power sector by 2050.

Pathway 1: Renewables and storage rely solely on expanding variable renewable energy, namely solar, wind, and energy storage systems.

Pathway 2: Balanced combines balancing power plants, such as flexible engine power plants, and renewable energy and energy storage systems.

The findings show that the Balanced pathway achieves net zero faster and more cost-effectively, with projected savings of over 42% (EUR 65 trillion), 21% lower emissions, and half the land use for renewables from 2025 to 2050 compared to the Renewables and storage pathway.

This significant cost reduction is largely due to minimised curtailment and reduced renewable energy overcapacity enabled by balancing power plants, providing additional flexibility and optimising the overall system.

The study also finds that over 76% of annual emission reductions are achieved before sustainable fuels are introduced from the middle of the next decade (2035 in our model), demonstrating that we can achieve more than three-quarters of our power sector carbon goals without using scarce sustainable fuels for power generation.

The results show that including balancing power plants is crucial for a rapid and cost-effective path to net zero. While renewable energy is key to decarbonisation, system reliability depends on flexibility. Energy storage offers near-instantaneous flexibility while balancing power plants, providing critical reserves and short—and long-term flexibility during breaks in renewable generation. Together, they support a reliable and optimised renewable energy system. Adding balancing power also reduces reliance on inflexible assets, such as coal plants, and will, therefore, accelerate emissions reductions.

This report underscores the need for coordinated action in renewables expansion, market reforms, and leveraging existing technologies to enable a timely and cost-effective transition to net zero.

THE SIGNIFICANT ADVANTAGES OF ADDING BALANCING POWER PLANTS

EUR 65 trillion reduced costs: The study shows that compared to the renewables and storage-only pathway,

the deployment of balancing power plants reduces the total cost of future power systems by as much as 42%, approximately EUR 65 trillion.

21% reduced emissions: Adding balancing power can reduce the total cumulative power sector CO_2 emissions between now and 2050 by 21% compared to the renewables and storage path.

88% less wasted energy: The modelling shows that the use of balancing power allows for enhanced power system optimisation, resulting in 88% less wasted energy due to renewable curtailment by 2050, compared with the other pathway. In total, 458,000 TWh of curtailments would be avoided, enough to power the whole world (based on current electricity consumption) for more than 15 years.

50% less renewable capacity and land needed: By adding balancing power plants, we can halve the total required renewable capacity and significantly reduce the land needed to build wind and solar infrastructure, which would otherwise need to cover an area comparable to the size of Europe.

ACCELERATING THE GLOBAL ENERGY TRANSITION

The global energy transition continues to gain momentum, driven by targeted policy support and decreasing renewable energy costs. 2023 saw a record-breaking 565 GW of new renewable capacity—a 60% increase from 2022. Total installed renewable capacity reached 4,000 GW, supplying nearly 30% of global electricity demand.

These milestones reflect significant progress in decarbonisation efforts, yet we are falling short of the target set at COP28 to triple renewables to 11,000 GW of renewable capacity by 2030. As of 2022, the power sector contributed approximately 40% of total energy-related CO_2 emissions, underscoring the necessity of meeting these targets to achieve the climate goals outlined in the Paris Agreement.

To stay on the narrowing path towards net-zero emissions, we need to urgently enter an 'era of implementation.' Concrete actions and supportive policies are needed to drive the essential investments required for power sector transformation. It is crucial to ensure that our actions are guided by clear data, enabling the fastest transition to a sustainable energy system at the lowest cost.

DETERMINING THE OPTIMAL PATHWAYS TO NET ZERO

A broad consensus has emerged on the importance of rapid decarbonisation, yet perspectives differ on the power sector's most effective pathway to achieving net-zero emissions.

Some advocate for an approach centred exclusively on variable renewable energy sources, such as wind and solar, supported by energy storage systems like battery energy storage. Others argue that, while renewables and energy storage systems are essential, additional flexibility is critical to ensuring a reliable and cost-effective power supply.

Given the urgency of coordinated global action, Wärtsilä initiated this global power system modelling analysis to evaluate the viability and optimality of widely discussed decarbonisation pathways.

Contrasting choice of net-zero pathways
In this study, we define two contrasting pathways between 2025 and 2050 to achieve net-zero power systems, with the goal of better understanding the options and approaches for viable decarbonisation.

PATHWAY 1: RENEWABLES AND STORAGE

Power sector expansion relies exclusively on variable renewable energy (VRE) and energy storage systems (ESS) in the Renewables and storage pathway. Existing power plants are gradually decommissioned by 2040 but are allowed to operate within emission limits until retirement. No new power generation capacity except for renewables and energy storage systems is introduced during the modelling horizon.

PATHWAY 2: BALANCED

In the Balanced pathway, expansion is also led by renewable energy and energy storage systems, but with the addition

continued from page 31

of balancing power plants that provide additional flexibility and enhance system performance. These are enabled for sustainable fuels expected to become more widely available in the 2030s.

Existing inflexible power plants are gradually replaced with new capacity upon retirement. Capacity additions for nuclear, biofuels and coal and gas plants with carbon capture and storage (CCS) follow conservative projections from publicly available sources, such as the International Energy Agency (IEA) and the International Atomic Energy Agency (IAEA).

At the COP28 Climate Summit 2023, governments committed to the global tripling of renewable capacity by 2030, expanding to 11 TW this decade. This target capacity is deployed in the model and in both pathways. From 2025, the system will optimise capacity expansion and generation based on defined constraints and the unique technologies available in each pathway. This optimisation aims to minimise total system costs while meeting constraints for availability, reliability, and carbon limits necessary to achieve the Paris Agreement targets.

To reduce computational demands, the global power system is modelled as a single, aggregated system using data from multiple independent research and data providers. This approach necessitates simplifying regional differences and producing an average view of the global power system. Both pathways apply consistent assumptions for key variables, including technology costs, fuel prices, renewable energy profiles, annual emission limits, hydrogen demand outside the power sector, and load profiles (excluding electrolyser demand). The model's results are broadly aligned with those of major energy institutions, such as Bloomberg New Energy Finance (BNEF), International Energy Agency (IEA), and International Renewable Energy Agency (IRENA), which employ more detailed, bottom-up, and sector-specific approaches.

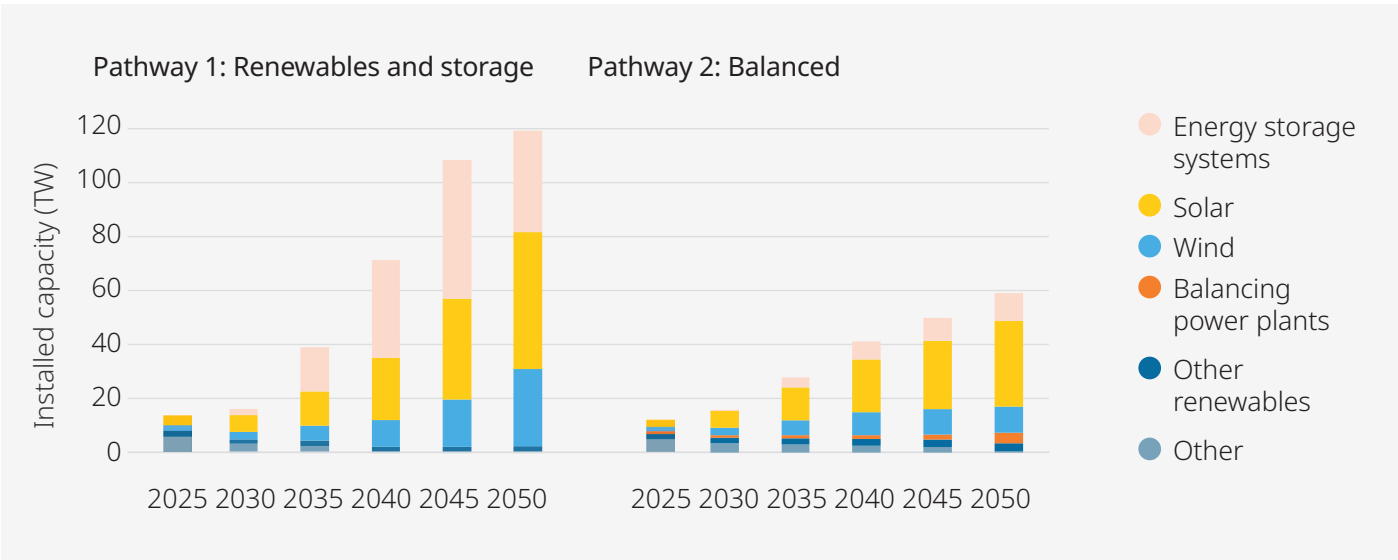
CAPACITY EXPANSION

In the Renewables and storage path, the installed capacity of variable renewable energy (solar and wind) will increase to over 79 TW by 2050, while energy storage capacity will expand to more than 37 TW—31-fold and 441-fold increases, respectively, compared to total installed capacities in 2023.

In the Balanced path, variable renewable energy capacity will reach over 41 TW by 2050, with energy storage capacity expanding to over 10 TW—16-fold and 123-fold increases, respectively. This Path also incorporates nearly 4 TW of balancing power plants as part of the optimal capacity mix.

Comparing these results, we see a significantly higher renewables and energy storage build-out in the Renewables and storage path. This suggests that even a relatively small number of balancing power plants added in the Balanced pathway reduced the need for extensive over-expansion of renewables and energy storage systems to achieve a cost-optimal system.

A notable outcome in the Renewables and storage path is the vast scale of renewable expansion required. The



Capacity mix 2025-2050

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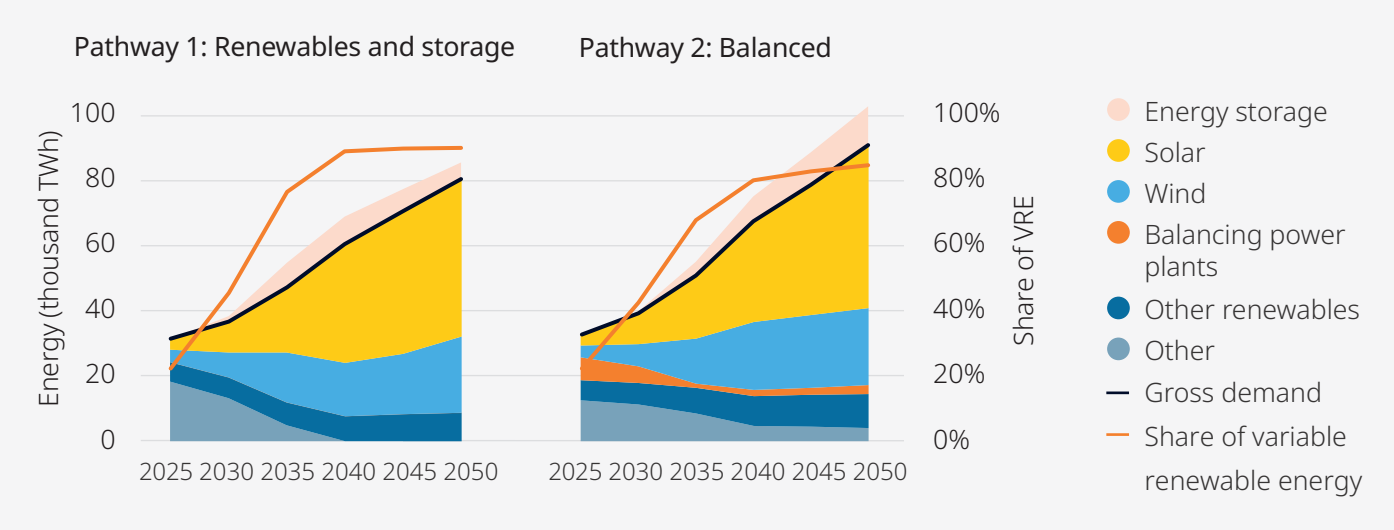


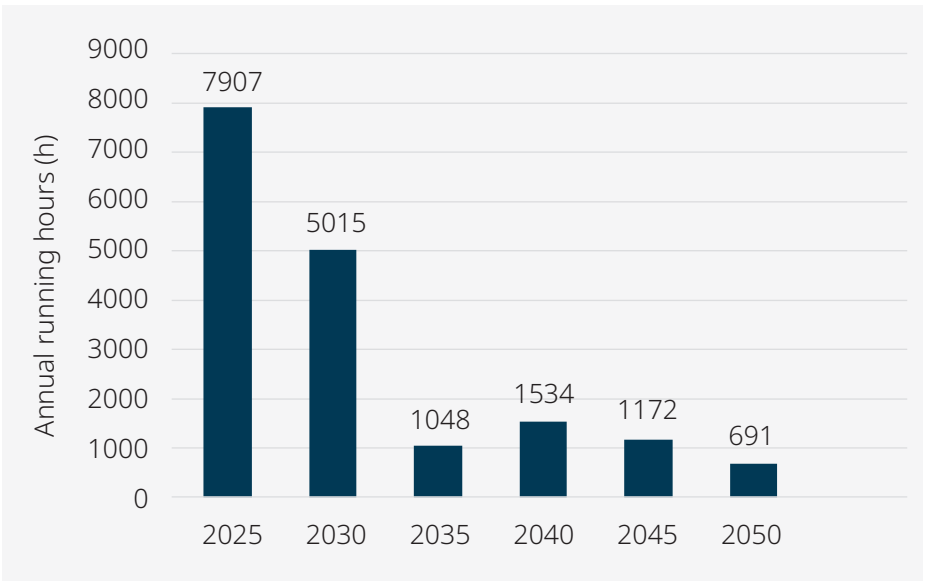
Energy mix 2025-2050

land needed for the wind and solar infrastructure alone would cover an area comparable to the size of continental Europe, posing significant challenges for land rights, permitting, and the geographic reach of transmission systems.

SHARE OF GENERATION

In both pathways, variable renewable energy will meet the majority of total electricity demand by 2035, reaching 90% and 85% of total net power generation by 2050 in the Renewables and Storage pathway and Balanced pathway, respectively. The share of demand met by energy storage in 2050 reaches 6.5% in the Renewables and storage pathway, while in the Balanced pathway, it reaches nearly 13.5%. In the Balanced pathway, the share of demand supplied by balancing power plants gradually decreases from approximately 23% in 2025 to 3% in 2050.

Although balancing power plants plays a key role in optimising the system, the modelling results show they will be operated with relatively low running hours. However, their operational profiles are characterised by high ramp rates and frequent starts and stops. This indicates that high operational flexibility is essential for these assets to effectively support renewable balancing, making inflexible assets, such as legacy baseload plants, ill-suited.

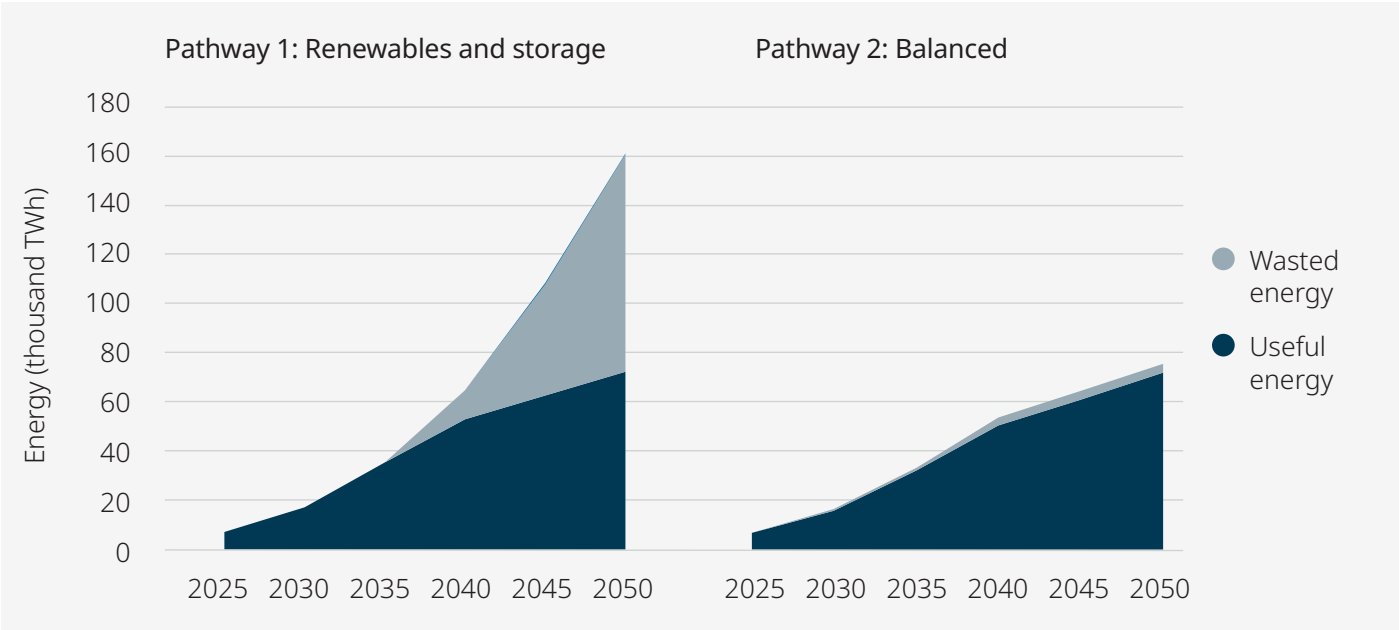


Equivalent running hours of balancing power plants

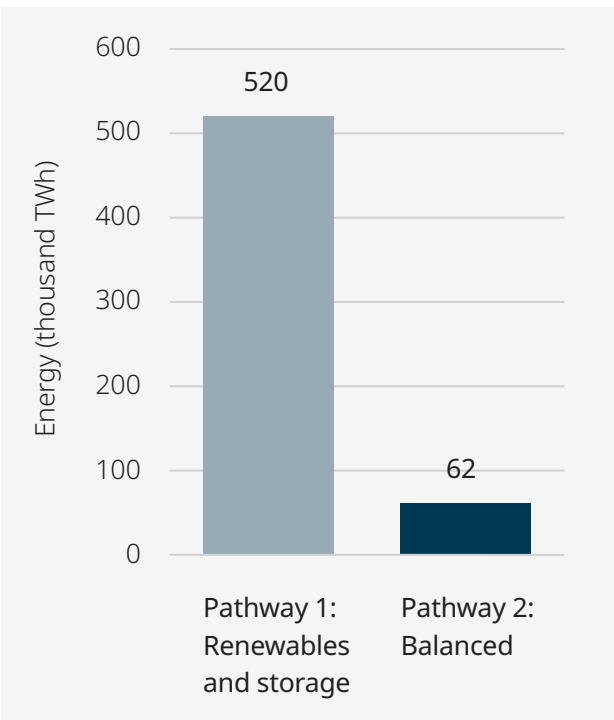
CURTAILMENT

While both pathways meet a substantial share of power demand through renewable energy generation, the differing levels of capacity expansion across the pathways significantly impact how the system manages renewable generation. Although curtailment does not necessarily indicate system inefficiencies and can play a crucial role in maintaining stability and overcoming transmission constraints, excessive curtailment may signal serious system constraints or limitations, resulting in wasted energy.

In the Renewables and Storage pathway, renewable energy curtailment will rise sharply in 2035 and beyond, reaching approximately 55% of total renewable energy generation by 2050,



Curtailment of renewable energy



Total curtailment of renewable energy 2025-2050

compared to only 5% in the Balanced pathway. To contextualise this, the cumulative curtailed energy in the Renewables and storage path from 2025 to 2050 would be enough to meet the entire 2023 world power demand (based on current electricity consumption) for more than 15 years.

FUEL DEMAND AND SUSTAINABLE FUELS

In both pathways, the power sector plays a critical role in the production of sustainable fuels, which are essential for economy-wide decarbonisation, especially in hard-to-electrify sectors like industry, marine transport, and aviation.

In the Balanced pathway, additional hydrogen is generated for the power sector from the mid-2030s onward. Given the relatively high cost of hydrogen-derived sustainable fuels, these fuels are used exclusively for low-running-hour balancing power, providing additional system flexibility when the installed energy storage reaches its power or storage limits.

EMISSIONS

In both pathways, carbon emission limits are imposed to ensure compliance with Paris Agreement targets, with both pathways achieving net zero by 2050 at the latest. However, the rate of emission reduction varies significantly between the two pathways. In the Renewables and storage path, the rate of decline is more gradual due to the lack of long-duration flexible capacity necessary to completely eliminate the need for legacy inflexible power plants.

By contrast, the Balanced pathway sees a more rapid decline in emissions as inflexible assets are phased out and replaced by renewables supported by energy storage and sustainable-

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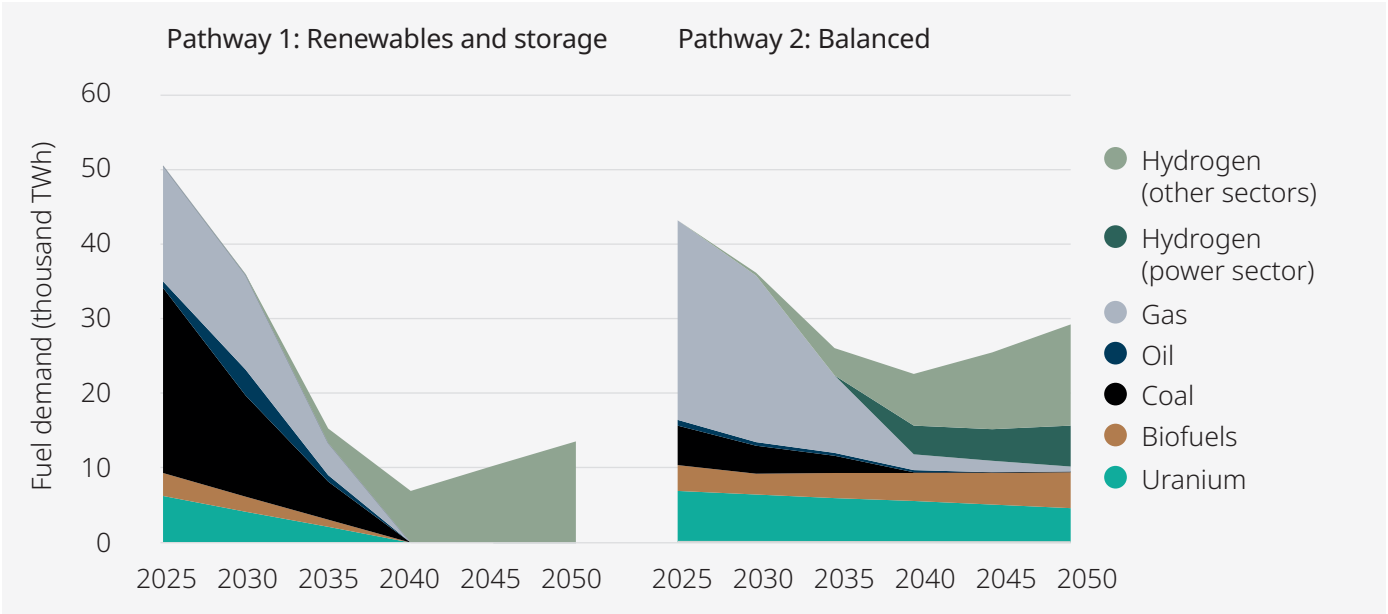
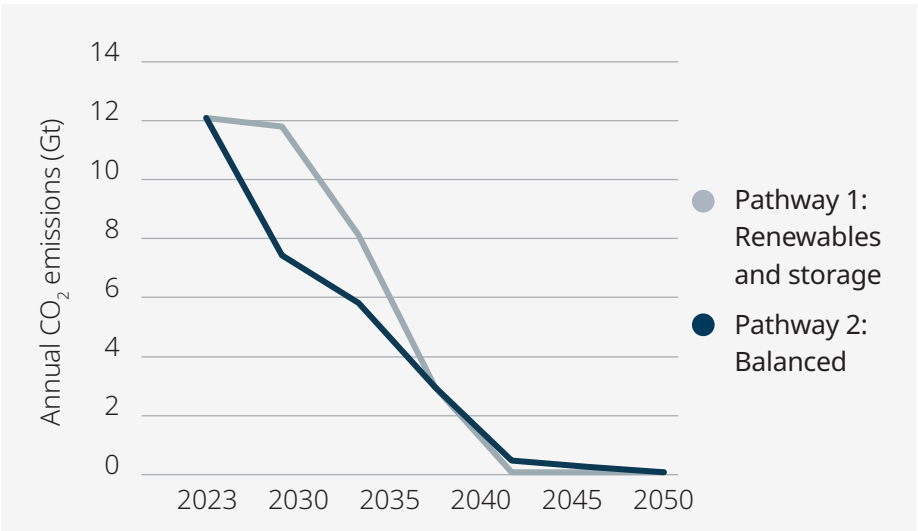
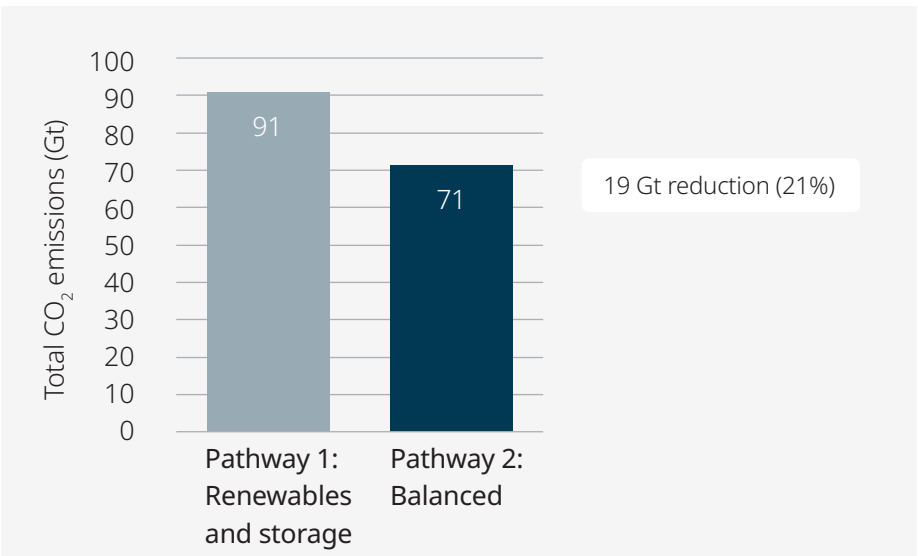


Fuel Demand



Annual CO_2 emission comparison (power sector)



Total CO_2 emissions 2025-2050 (power sector)

fuel-ready balancing power plants to provide firm, reliable power over long durations. Consequently, the Balanced pathway will achieve a nearly 21% (19 Gt) reduction in cumulative emissions by 2050 compared to the Renewables and Storage pathway, equivalent to over 1.5 years of current global power sector emissions.

A notable finding in the Balanced pathway is that over 76% of annual emission reductions are achieved before sustainable fuels are introduced in the power sector in the mid-2030s.

This reduction is driven primarily by the scale-up of renewables and energy storage and reduced operating hours for balancing power plants running on gas. The remaining 24% of annual emission reductions are achieved following adopting sustainable fuels.

TOTAL SYSTEM COST

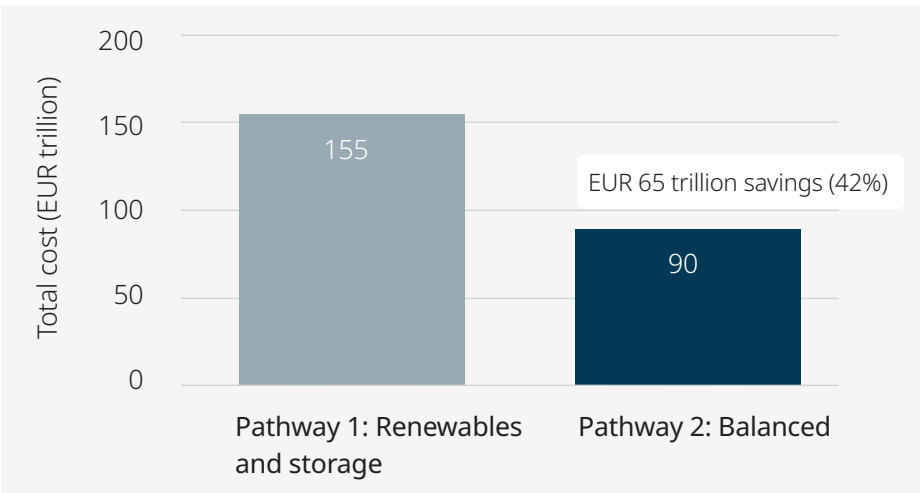
Overall, the total system cost between 2025 and 2050 is estimated at approximately EUR 155 trillion for the Renewables and storage pathway and EUR 90 trillion for the Balanced pathway. This translates to a cumulative saving of over EUR 65 trillion for the Balanced pathway compared to the Renewables and storage pathway - equivalent to more than 60% of global GDP today.

These cumulative costs translate to a levelised electricity (LCOE) cost of EUR 93/MWh for the Renewables and storage pathway and EUR 60/MWh for the Balanced pathway. The significant cost disparity between pathways is largely due to the substantial overcapacity of renewables in the Renewables and storage pathway and the high volume of wasted energy due to curtailment.

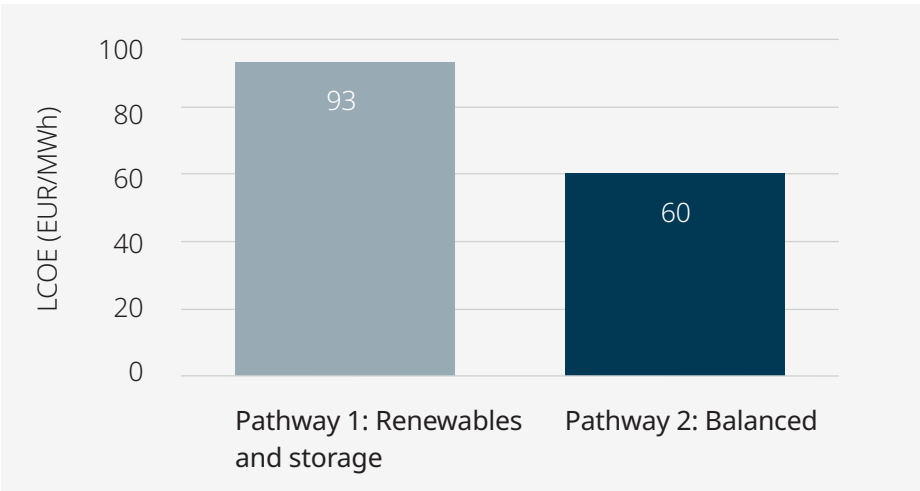
CLEAR PATHWAY FORWARD

The modelling results are compelling in evaluating the different pathways to achieve net zero: the inclusion of balancing power plants is crucial for cost-effective system optimisation. Renewable energy is at the core of decarbonisation, but system reliability hinges on flexibility.

Flexibility comes in various forms, each playing a vital role. Energy storage is essential for near-instantaneous



Total system cost 2025-2050



Levelised cost of electricity 2025-2050

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flexibility and short-duration energy shifting, while balancing power, available during extended breaks in renewable generation, provides flexibility over sustained periods. Ultimately, deploying balancing power alongside energy storage is the optimal technology mix to support renewables.

A CALL TO ACTION FOR THE POWER SECTOR

As the optimal pathway is clear, decisive actions from the entire power sector are now crucial to achieving a low-cost and low-emission energy transition in line with the 2050 Paris Agreement. Instead of only focusing on the acceleration of renewable build-up, holistic system-level thinking must be in place when investing in and planning power systems.

Data should guide strategic planning for future power systems and capacity additions to achieve a rapid transition and a cost-optimal technology mix for affordable electricity.

1. ENABLE AN ACCELERATED EXPANSION OF RENEWABLES AND BALANCING TECHNOLOGIES

- Enable fast expansion of renewables by upgrading transmission systems, streamlining permitting processes, and investing in regional interconnectors.
- Rapidly expand short- and long-term balancing technologies to ensure grid reliability and resilience. Together, these technologies support the rapid growth of renewable energy, reduce reliance on inflexible assets, such as coal plants, and accelerate emission reductions.
- Mobilise financing to secure renewable development and balance power projects at the necessary scale and speed.

2. REDESIGN ELECTRICITY MARKETS TO INCENTIVISE FLEXIBILITY

Reform electricity market structures to support greater integration of variable renewable energy. Balancing should be incentivised to provide essential flexibility to optimise renewable energy systems.

- Increase dispatch granularity to 5-minute resolution in energy wholesale markets. Shorter and more precise time frames for pricing and supply adjustments will support variable renewable energy integration and incentivise flexible balancing power plants that can respond quickly to changes in electricity demand.
- Introduce new ancillary services, such as reserve, ramping, voltage, and inertia products, to guarantee grid stability. The need for ancillary services increases with higher renewable penetration, and the supply can be co-optimised with energy and balancing requirements and provided by balancing technologies.
- Establish bankable revenue models for low-running-hour balancing power plants, including mechanisms like flexibility-linked capacity payments and scarcity pricing. Balancing power plants provide crucial system- level benefits, yet due to low capacity factors, additional revenue mechanisms are needed to yield sufficient investments into balancing assets.

3. CHOOSE THE RIGHT FUTURE-PROOF TECHNOLOGIES AND PREPARE FOR SUSTAINABLE FUELS

- Select balancing technologies that are future-proof and ready to introduce sustainable fuels to decarbonise the power sector from the mid-2030s onwards fully.
- Support rapid ramp-up of renewables

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continued from page 38

and enable the phase-out of legacy technologies by using natural gas as a transition fuel for flexible balancing power plants. This should not be confused with a 'status quo' approach, as gas will be used very differently than today and in much smaller amounts. Bridging the transition with gas for balancing can cut more than 75% of annual power sector CO_2 emissions by 2035 (compared to the 2023 level).

- Prepare for introducing sustainable fuels by building the needed expertise and infrastructure to ensure a seamless transition to a fully decarbonised power sector in the future. Once sustainable fuels become viable at scale, i.e. commercially available and competitive, emission reductions can be pushed to 100%. Competitiveness or cost-parity of sustainable fuels will require policy action, which could be in subsidies, regulation, or carbon taxes (or a mix).

AMERICAS

United States: The composition of US power generation has been transformed in the last decade. Coal generation has dropped drastically and is rapidly being replaced by renewables and natural gas, resulting in greenhouse gas emissions reductions of over 5% since 2015. Government incentives, such as the Inflation Reduction Act (IRA), state-level net-zero mandates, and declining technology costs, will continue rapidly growing renewable generation. This growth brings more variability in energy production and requires flexible dispatchable generation to manage that output. While, for example, Texas has become the leader in wind and solar generation, the state also introduced a fund to support new investment in flexibly dispatchable, non-duration limited balancing power. The fund aims to support its rapidly growing economy and ensure reliable, affordable electricity. In 2023, California, long held as the front-runner for renewable energy ambitions, needed to curtail over 2.6 million MWh of renewable energy due to grid inflexibility. That's enough energy to power 250,000 homes. Flexible balancing power is crucial to support intermittent renewables and avoid massive curtailments that will otherwise result in costs for the consumer. More incentives are needed to ensure balancing technologies are embedded in the US power systems.

Brazil: Extreme weather conditions, like Brazil's historic drought this year (2024), have highlighted the urgent need for energy diversification to ensure system reliability. With reservoir levels sharply declining, flexible solutions are urgently needed to prevent blackouts and maintain power system stability. Incorporating balancing power plants will be key to enhancing system reliability and flexibility. Balancing power, such as flexible engines, can support renewables, especially during critical drought periods, and are economically accessible and technologically advanced. As Brazil prepares to host COP30 in 2025, focusing on sustainable energy solutions becomes even more crucial. The country has a unique opportunity to showcase its commitment to a resilient and affordable energy future by integrating renewables, energy storage, and balancing power to deliver a balanced approach to achieving net-zero emissions. This approach ensures system stability, accelerates decarbonisation and reduces overall emissions.

Chile boldly aims to achieve a fully renewable energy mix by 2050. The country has already made significant

progress in adding renewable generation, but greater system flexibility is needed to address the intermittency of solar and wind energy. This aligns with the findings of our report, which emphasises the critical role of balancing power plants in enhancing system reliability and flexibility during extended breaks in variable renewable energy generation. Incorporating flexible balancing power, such as grid balancing engines that can be rapidly started and stopped, could provide the necessary balance when renewable resources are unavailable, complementing the country's carbon neutrality goals. Our research in Chile estimates that combining renewables, energy storage, and balancing power could save $17 billion by 2045. However, similar to global challenges, limited transmission infrastructure and the need for a supportive regulatory framework remain critical challenges for efficiently integrating renewable energy and ensuring a sustainable transition. This underscores the need for coordinated action in renewable expansion, market reform, and leveraging existing technologies to enable a timely and cost-effective transition to net zero.

EUROPE AND AFRICA

Finland aims to achieve carbon neutrality by 2035, with a significant increase in weather-dependent renewable capacity, particularly wind power. Concurrently, the power system will gradually reduce firm capacity as older inflexible fossil fuel units retire. Despite this, firm and flexible capacity remains essential to compensate for wind power during unfavourable weather conditions, especially during extended cold and low-wind periods. Our recent Finland modelling indicates that, with the current power system in Finland, electricity prices will be 30% higher by 2027 compared to 2023. To address this, we calculated that integrating 2 GW of firm and flexible balancing power can reduce electricity costs by 10%, equivalent to EUR 1.3 billion, and enhance system stability. Therefore, adopting a carefully designed, future-proof capacity mechanism is crucial. New firm and flexible capacity, energy storage, and demand-side response will also be key to ensuring future supply security and achieving climate targets.

Poland aims to accelerate its shift away from coal, which is currently its leading source of power and heat generation. The country has brought forward its coal phase-out target from 2049 to 2035 and aims to achieve carbon neutrality by 2050. The share of renewables in Poland is steadily growing, accounting for 27% of energy production today (up 3% year-on-year), with plans to increase onshore and offshore wind capacity from 10 to 25 GW by 2030. The critical challenge is the lack of balancing capacity in the grid, which poses a risk to stability.

Poland also has Europe's largest district heating network, with a total capacity of 54 GW consisting mainly of coal-fired boilers. Decarbonisation and modernisation of this sector pose both a challenge and an opportunity, as district heating networks also represent the largest source of flexibility for the grid. Our recent modelling in Poland shows that cost-effective decarbonisation of both sectors is possible by co-optimising heat and power. This will allow Poland to increase its share of renewable energy to 68% in 2032, reduce the share of coal to 26% in power and 8% in heating, and deliver cumulative savings of 3.8 BEUR. To achieve this, it is paramount that Poland introduces a diverse range of flexible technologies, with combined heat and power engines, heat pumps, and heat storage as key facilitators,

continued from page 41

supplemented by electric boilers and battery energy storage.

South Africa plans to grow renewable capacity to 17.7 GW by 2030. Our analysis of the country shows that a balanced system with flexible power generation, running on gas and energy storage, is crucial to integrate this variable renewable capacity, ensuring grid stability and reliability. The state-owned power utility Eskom's recent 3 GW GASIPPPP tender for ultra-flexible gas validates the need for this flexible generation identified in our modelling.

Morocco's updated nationally determined contribution (NDC) commits the country to reduce greenhouse gas emissions by 18.3% by 2030. To achieve that, it aims to reach 52% renewable electricity by 2030; however, integrating renewables at this scale poses challenges. Our modelling in Morocco recommends a balanced system with renewables, battery energy storage, and flexible power plants, including 60% of grid-balancing engines. This combination can optimise renewable integration, reduce fuel costs, and ensure reliability to achieve that ambition via a cost-effective, low-emission pathway.

MIDDLE EAST AND ASIA

India: Imagine a future where India's power grid seamlessly integrates 500 GW of non-fossil fuel sources by 2030. Investing in resources like balancing power plants is vital to achieve this vision. Studies indicate that by 2030, India will need 9 GW of flexible balancing engines, utilising gas, to efficiently and reliably integrate renewable energy. We can attract investments in flexible technologies and low-running-hour balancing power plants by restructuring the power market to provide a bankable revenue model. This strategic shift will ensure a stable and sustainable energy future for India.

Indonesia: Achieving Indonesia's net zero target by 2060 or sooner is possible but requires significant efforts to add renewables and balance solutions at scale while phasing out inflexible power plants. Expanding renewable energy generation rapidly in the short term is crucial for achieving climate goals. Our recent modelling of Indonesia shows that renewable power generation in Indonesia could be 3-4 times higher than the current targets. Still, it is vital to match the increase in renewable power with the addition of balancing technology to optimise overall energy production costs.

Saudi Arabia has started its energy transition journey, and its first giga-scale renewable energy projects are now in construction. Currently, 8 GWh of energy storage capacity is being tendered, and a new generation of young, environmentally conscious Saudis is playing a key role in the country's future energy planning. The Saudi vision is focused on achieving 50% renewables and 50% natural gas-based electricity by 2030. The need for flexibility is being recognised as the crucial enabler of system reliability and renewable integration.

The **United Arab Emirates** is the green energy leader in the Middle East. However, with the technological changes in water desalination and the addition of nuclear energy and robust solar farms, the UAE is facing new challenges with its energy system. The winter season will require efficient balancing, while the hot season needs firm and efficient power. National utilities have identified the need for additional dispatchable and flexible capacity. They will install over 2.5 GW of

gas-based power plants to cater to the system's peak and mid-merit demand. This will enable further acceleration of the clean energy transition in the UAE.

METHODOLOGY

The analyses in this report are based on techno-economic optimisation to determine the least-cost capacity mix required to meet future electricity demand while adhering to emission limits and other political constraints. Conventional power plants are included with their technical specifications and fuel sources to accurately model their emissions and role in balancing variable renewable generation. Wind and solar generation are modelled using hourly profiles based on weather data.

This detailed optimisation uses a chronological approach, balancing the variability of renewable generation and load on an hour-by-hour basis from 2023 to 2050. The model co-optimises system expansion with dispatch, using a one-hour resolution to capture load and renewable generation patterns in great detail.

The global power system is aggregated into a single model, aligning regional power profiles to preserve daily patterns such as demand peaks and regular solar output. This aggregated approach avoids time-zone discrepancies that could distort demand and generation profiles.

COMMON ASSUMPTIONS

Both Pathways share baseline assumptions for key factors:

- Starting capacity mix in 2023
- Annual power sector CO_2 limits through 2050, consistent with the Paris Agreement and net the zero CO_2 emissions of the whole energy sector by 2050
- Renewable target of 11 TW by 2030
- Fuel and carbon prices5, CO_2 content per fuel type, load growth3, technology costs and learning curves3 and renewable/load profiles.
- No land-use restrictions; land requirements calculated post-simulation.
- Sustainable fuel is assumed to be hydrogen, but other carbon-neutral fuels could also be modelled

LIMITATIONS

The model is based on a single weather year, a common approach for long-term planning but limited in capturing multi-year variability. Consequently, the results do not include a reliability margin, and capacity needs may be slightly higher in scenarios with adverse weather years. This limitation particularly affects the Renewable Energy Only Pathway, making the presented cost and curtailment estimates conservative. wn

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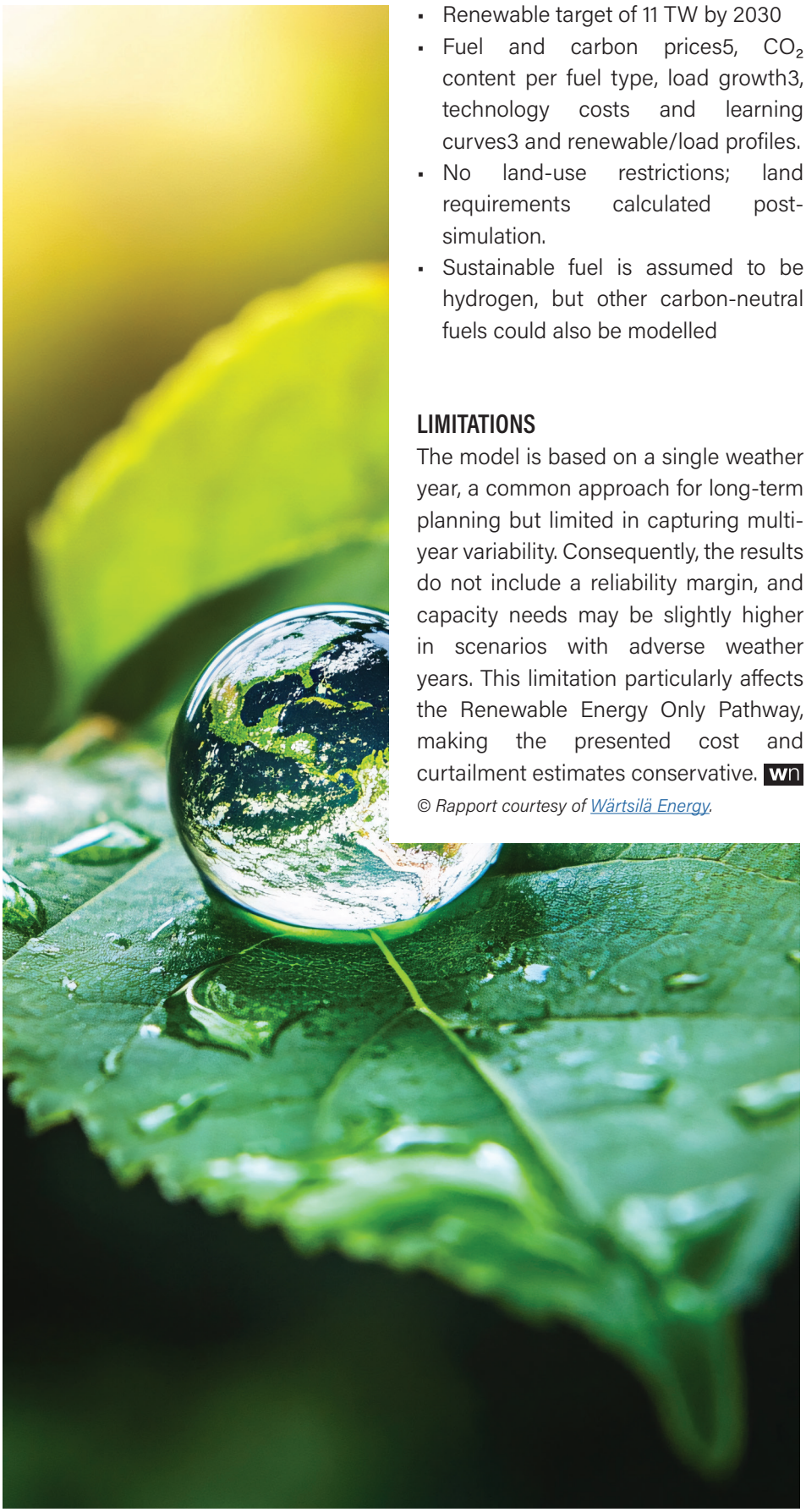


Using Artificial Intelligence to Optimise the Flow of Energy through the Built Environment

MANAGING THE THERMAL EQUILIBRIUM OF A BUILDING USING DYNAMIC MODULATION TO ACHIEVE IMPROVED OCCUPANT COMFORT AND GREATER ENERGY EFFICIENCY

Energy efficiency must be embraced as a dynamic resource to achieve real efficiency gains in our built environments. Instead of using a static operating model of building operations and maintenance, we need to think about energy in terms of flow and modulate equipment performance dynamics in response to how the internal and external environments change over time.

Effectively managing the thermal equilibrium of a building using dynamic modulation is a complex process that requires continuously optimising energy flow to ensure occupant comfort and maximum energy efficiency. The first steps towards maintaining a building at equilibrium are calculating its energy leak rate and determining the ideal HVAC system settings to ensure optimal levels for the power-to-thermal load relationship. However, both the energy leak rate and the power-to-thermal load relationship are dynamic, which means that they change over time as the various factors that impact energy flow change, including occupancy, weather conditions, and demand.

The dynamic thermal equilibrium process shown in Figure 1 is based on understanding the built environment as an ecosystem of interdependent systems. Maintaining energy balance requires calculating all of the energy flowing into the building, including purchased energy and appliances, lighting, and people, and then balancing those inputs with thermal losses due to such factors as ventilation, infiltration, and drain water. However, these factors are dynamic, not static, so the thermal equation for a building—and each building has its own unique equation—is constantly changing as conditions change. As a result, effectively maintaining a building at a balanced thermal equilibrium also requires finding ways to accurately predict how these inputs and outputs change over time and to ensure that all systems react to these expected changes in the best possible way. However, because of the complex nature of energy flow, manually determining a building's thermal energy equation and then managing the energy flow is difficult.

In the built environment, using Artificial Intelligence (AI) is an extremely effective way to maintain a balanced thermal equation. One of the benefits of using AI in the building management space is that it can determine the thermal energy equation for a building in a fraction of the time required by individuals. The real value of AI arises when it's used to predict how the flow of energy will evolve and, if it anticipates an unwanted thermal event in the future, to make adjustments to the HVAC system to eliminate that event before it happens. In addition to determining which adjustments are best for ensuring occupant comfort, AI can also evaluate the optimal HVAC system configuration required to achieve greater energy efficiency, thereby saving money and making buildings greener by reducing the load on the power grid.

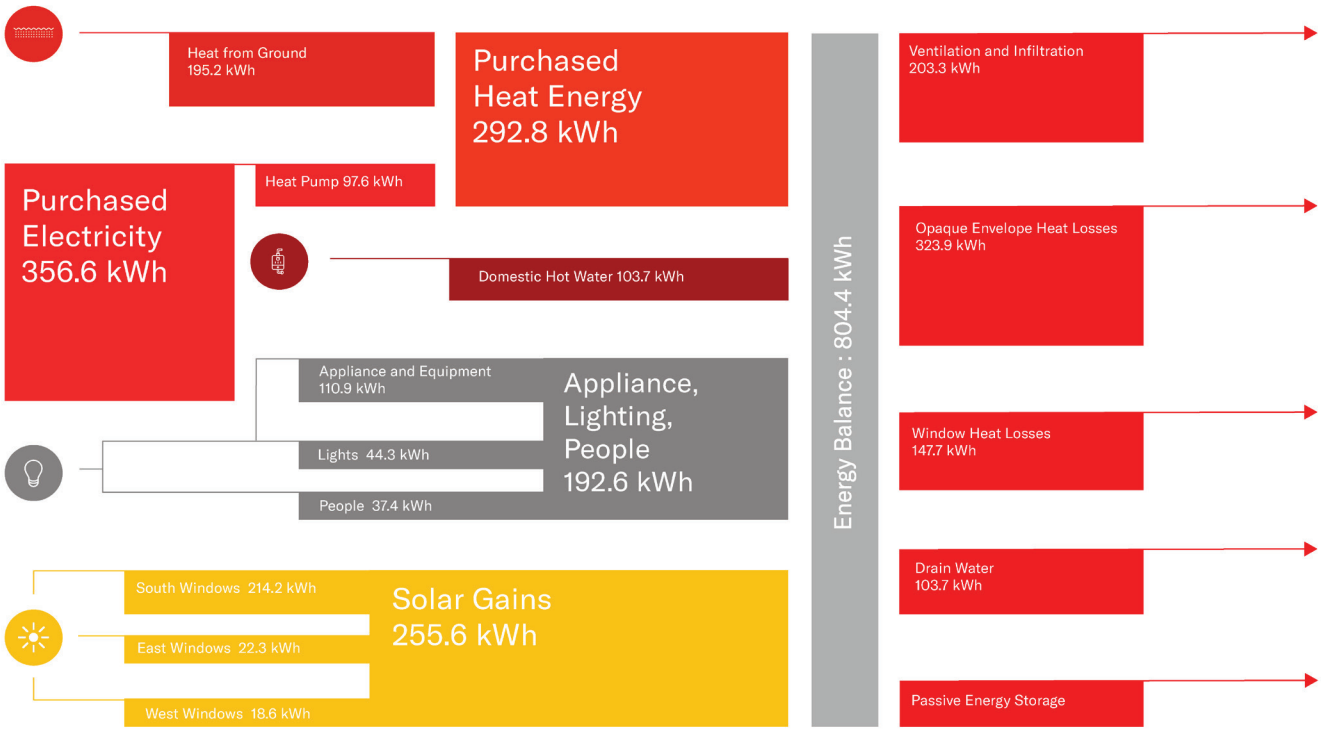


Figure 1: The Dynamic Thermal Equilibrium Process in the Built Environment

CHARACTERISING THE RIVER OF ENERGY

Every built environment has a unique set of habits and behaviours that affect the river of energy that flows through it. These characteristic behaviours are expressed in a collection of thermal energy equations, which, once calculated, will not change over time for a building unless major renovations are carried out.

Characterising the river of energy by calculating a building's thermal energy equation is the first step towards optimisation and requires calculating its energy leak rate and power-to-thermal load relationship.

1. THE IMPORTANCE OF ZONES

The best way to characterise the collection of thermal equilibrium equations for a building is to divide it into zones or divisions and then derive the equations for each zone. This requires collecting historical data from the zones and then looking for patterns in that data to isolate each zone's habits and behaviours. Once the specific energy leak rate and power-to-thermal load relationship have been calculated for each zone, the next step is to aggregate the characterisations of all the zones into a group of zones.

While these tasks can be performed manually, an AI engine can perform them in a fraction of the time, accomplishing in 2 minutes what it would take an engineer 3 weeks to do.

2 ENERGY LEAK RATE

According to the laws of physics, thermal energy will always work to reach an equilibrium, so energy will always flow across a differential to balance the amount of energy on either side. There is no flow if the energy levels are balanced in a system.

However, if the thermal energy on one side is higher than on the other, energy will flow at a certain rate across this differential until equilibrium is achieved.

In the built environment, there are barriers in place, including walls and windows, that work to slow down this rebalancing. The energy leak rate—hereafter referred to simply as the leak rate—is the speed at which energy moves across these barriers and measures the quantity of heat that a built environment loses or gains over a given period of time. It refers to the rate at which energy flows either into or out of a given zone. Each zone has its unique leak rate based on how it was built—including the types of materials used, like insulation and windows—and on its operation and maintenance.

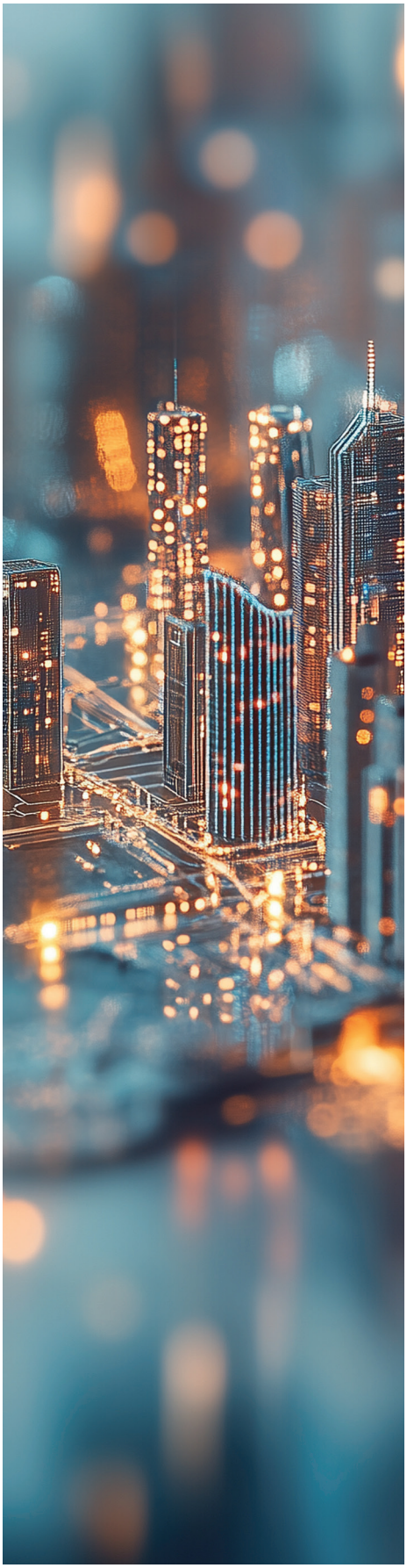
There are two critical factors to consider when calculating leak rate. The first is that every barrier has a unique leak rate dependent on its material composition and how the building was built. Therefore,

continued from page 45

two identical windows installed in two different buildings will have different leak rates. The other factor is that leak rates are dynamic and vary according to changing conditions, including occupancy and weather, which means that the energy flow in a zone constantly changes over time. For example, while energy would leak out of a zone on a typical spring morning because it is colder outside than inside, the leak rate in that zone could reverse later in the day if it becomes hotter outside than inside, meaning that energy would start to flow inward through the walls and begin to heat the zone.

One key to effective building management is maintaining the derived temperature of a conditioned space and ensuring occupant comfort by continually compensating for the leak rate. This means that if energy leaks out of a zone, then maintaining that zone at the derived temperature requires supplying thermal energy to that zone at the same rate it is leaving. If energy leaks into a zone because the outside temperature is higher, you have to cool the air and withdraw thermal energy at the same rate it enters.

Calculating the leak rate of a zone based on the materials used and mapping the dynamic of its leak rate under all possible conditions gives you a clear understanding of what will happen in that zone in terms of energy flow. Accurately calculating the leak rate is critical for maintaining a constant and stable temperature in a zone because if you know how quickly energy is leaking in or out of a zone at any given time, then you can adjust your HVAC system to produce and push the right amount of cold or hot air to compensate for the leak rate in real-time and maintain that zone at a constant temperature.



While maintaining a balanced thermal equilibrium in a zone can be done manually, managing the flow of energy through every zone in a building is neither economically nor procedurally viable. Deploying AI in the building management space represents, through dynamic modulation and forecasting, an accurate and cost-effective way to maintain a balanced thermal equilibrium. Initially, AI can be combined with linear regression analysis tools to quickly and accurately calculate the leak rates for all zones within a building under all possible conditions. But the actual value of this technology becomes clear when AI (1) uses the leak rate behaviour for a zone to predict what the temperature will be in that zone at different times in the future and then (2) makes adjustments to the HVAC system in real-time based on these predictions to eliminate any unwanted events from the zone's timeline.

3. POWER-TO-THERMAL LOAD RELATIONSHIP

The power-to-thermal load relationship refers to how efficiently the engine in an HVAC system converts power into thermal energy that it then delivers to the various zones in a building. Power is the input into the engine and is measured in kilowatts or cubic metres of gas; thermal load, measured as cubic meters of hot or cold air, is the amount of thermal energy delivered into the zones as output. In building management, it is the conversion relationship between the power that is fed into the engine and the air that is served that is interesting. The power-to-thermal load relationship measures the engine's efficiency level in the HVAC system in maintaining the desired temperature within a building's zones.

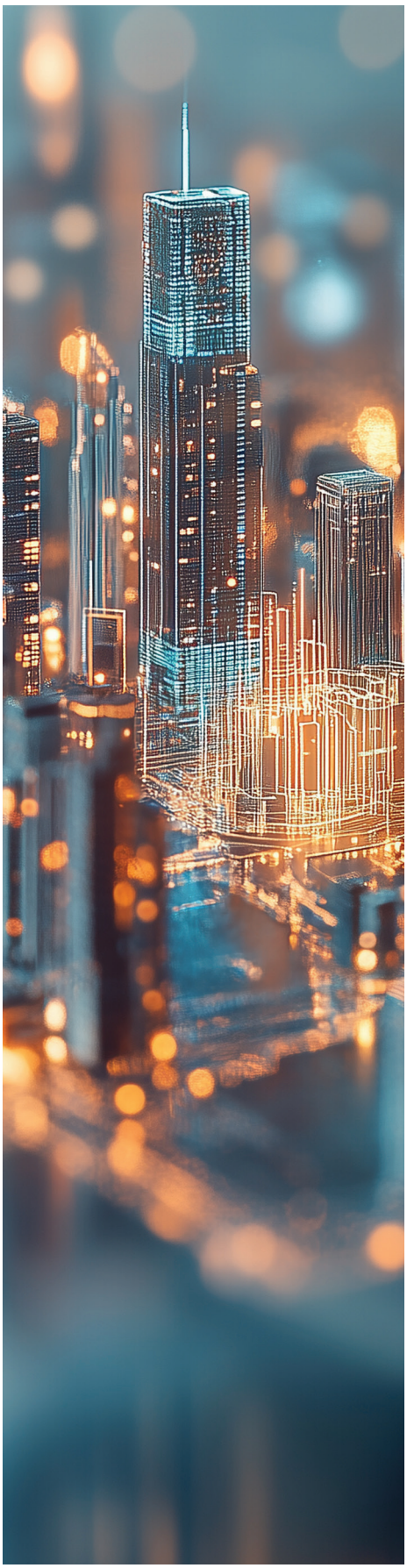
While the engine's efficiency is determined to a large extent by the

equipment that was purchased and how that equipment was installed, operators can adjust various settings on the engine to optimise its performance. For example, in addition to opening or closing dampers, operators can adjust the engine to serve more or less air/minute and slow the production of heat. Playing with these settings makes it possible to fine-tune the engine and find the ideal configuration—or combination of settings—for achieving the most efficient power-to-thermal load relationship for a given zone.

However, this relationship is dynamic in nature since the optimal power-to-thermal load relationship for a given zone is dependent on different internal and external conditions, such as occupancy and weather, that change over time. For instance, the ideal configuration for a specific zone with five occupants and no sunlight during the winter will be drastically different when there are fifty occupants with full sunlight during the summer.

Therefore, maintaining balanced thermal equilibrium in a zone in the most efficient and effective way possible—which means ensuring occupant comfort, saving money, and reducing carbon footprint—requires calculating the ideal engine configuration under all possible conditions for each zone within a building. While this would be costly and time-consuming to achieve manually, managing this power-to-thermal load relationship in a building is a task that is ideally suited for AI.

The process involves giving the AI all relevant data concerning the HVAC system's engine, including performance data, and the zones within the building, including historical data about occupancy levels and weather



conditions. From a data perspective, the AI would not be concerned with the kind of HVAC system installed within the building; it would simply look at the available data and calculate the ideal configuration for the engine from an efficiency perspective for all zones under all possible conditions.

For instance, to calculate the most efficient way to keep a zone in winter with five occupants at the desired temperature of 22 degrees, the AI would compare the power-to-thermal load relationship to see if the engine would consume less power by changing the configuration of the system to maintain the desired temperature. The goal in this instance would be to analyse the available data to find the right combination of factors that would allow the engine to produce the thermal energy required to maintain occupant comfort in the most cost-effective and environmentally- friendly manner.

PREDICTING ENERGY FLOW IN A BUILDING

Having characterised all zones in a building, the next step is to ensure that each zone reaches balanced thermal equilibrium at all times and under changing conditions. Accomplishing this requires predicting the future conditions within each zone according to selected variables and then, in response to those predictions, making adjustments in real-time to specific pieces of HVAC equipment to ensure that each zone always achieves thermal equilibrium.

AI is the most effective and efficient way to maintain equilibrium in the building management space.

While you could construct a simulation to model a building's behaviour, the process is significantly more time-

continued from page 47

consuming and less accurate than deep learning for optimisation. In comparison to a 40-50% accuracy rate when using simulations to predict building behaviour, our research shows that AI is far more accurate.

1. DEEP LEARNING

The first step is to use deep learning and months of historical data organised in advance to train the engine for each zone in a building.

Using deep learning, it is possible to predict what will happen in a zone in the future by first Calculating the leak rate and then using that projected leak rate to predict the temperature.

2. PREDICTING THE FUTURE

Then, the AI engine predicts a zone's behaviour based on its previously calculated leak rate and power-to-thermal relationship.

Since these features typically do not change, this characterisation can be used to calculate how the zone will react over time to changing conditions, such as occupancy and weather.

Our deep learning method uses the zone's leak rate behaviour and power-to-thermal relationship and what the AI has learned based on historical data to make predictions of the future value of different parameters.

These parameters can include whatever variables building owners want to manage, including temperature, humidity, and the concentration levels of different gases. From these predictions regarding the future value of key variables, the AI can decide how to manage best the thermal equilibrium for every zone in a building.

CHANGING THE FUTURE

1. IDENTIFYING THE RIGHT COURSE OF ACTION

When the AI engine, based on its predictions, sees an unwanted event in the future that will disrupt the balanced thermal equilibrium in a zone, the engine begins testing various micro-modifications to the HVAC system to figure out the effects that different combinations of adjustments will have on that zone's future conditions. The AI engine then uses the results of these tests to evaluate which combination of modifications to which pieces of equipment will, over time, most effectively eliminate the unwanted event. Once the right course of action is determined, algorithms instruct the HVAC control system to modify the selected components to get the zone to the desired condition.

For example, let us consider a situation in which the engine predicts that the temperature on a particular floor in a building will be too high in three hours.

In response to this prediction, the neural network runs models on different micro-modifications to the HVAC system to see the impact these possible modifications would have on the predicted temperature increase. Using this information, the AI decides on the best course of action—for instance, lowering the blinds and turning on the air conditioning—that will bring the floor to where it needs to be to ensure that the rise in temperature in three hours does not occur. It then instructs the HVAC control system in real time to make the desired modifications to create the right conditions on the floor.

2. RE-EVALUATION OF PREDICTIONS

In the next phase, the AI engine repeats the entire process later to check how the zone reacted to the modifications.

The results of the modifications on the specified variables are measured using the zone's thermal equation and the new conditions. It determines whether or not the instructions actually changed the future in the intended way and if these changes will eliminate the unwanted event. The deep learning engine then tests all the possible combinations of different modifications that could now be applied to eliminate the predicted event. Once this is done, the AI again selects those adjustments that will most effectively eliminate the predicted event and instructs the HVAC control system in real-time to make the required adjustments.

Continuing with the previous example of a predicted rise in temperature in three hours, the deep learning engine analyses the new conditions on the floor and its learning based on historical data to see what effects, if any, the changes had on that predicted rise in temperature.

Based on this information, the deep learning engine again calculates how effective different combinations of possible modifications will now be in eliminating the predicted rise in temperature. Once the AI determines the best course of action based on these calculations, it again instructs the HVAC control system to make the required modifications towards cancelling the predicted event.

In this way, the AI, by continuously making adjustments and then reassessing the effectiveness of those adjustments, changes the future in real-time and makes what you want to happen a reality. wn

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OLDMUTUAL

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From South Africa to the Netherlands:

UNLOCKING CAREER GROWTH, FINANCIAL BENEFITS, AND A BETTER QUALITY OF LIFE

With a high demand for engineering professionals, the Netherlands offers South Africans a safe and stable alternative to increase their earnings and improve their lifestyle.

Statistics from the United Nations Migrant Stock 2024 Report indicate that the Netherlands was among the top ten countries South Africans chose to move to in 2024, with more than 31.000 South Africans currently living in the Netherlands (up from 20.331 in 2020).

Dutch companies are clamouring to fill positions with highly skilled workers from South Africa to ease pressure on the labour market.

South African professionals are renowned for their strong work ethic, high qualifications, and cultural adaptability, making them ideal candidates for integration into Dutch society. Afrikaans-speaking South Africans, in particular, find it relatively easy to learn Dutch due to the significant overlap in vocabulary between the two languages.

Even those whose first language isn't Afrikaans benefit from this linguistic similarity, easing their transition into the Dutch workplace and community.

The relocation also offers a range of benefits to South Africans: higher earning potential, favourable tax advantages, outstanding work-life balance, improved safety and security, and better social and civil infrastructures.

MAKING A FINANCIALLY SOUND MOVE

In South Africa, the annual salary for an engineer with three to five years of experience can range between R1.2 million and R1.5 million. Engineers in the Netherlands enjoy salaries similarly but can access various financial benefits, including tax breaks.

Engineers from South Africa coming to the Netherlands on a highly skilled migrant visa can expect a minimum €4.171 if they're younger than 30 and a minimum monthly income of € 5.688 if they're older than 30. The Dutch immigration department determines this minimum income threshold and updates it annually. These amounts do not include the standard 8% holiday bonus typically paid in May.

This minimum income threshold ensures transparency and fairness in compensation, with salaries often supplemented by benefits such as performance bonuses, pension contributions, and professional development allowances.

In addition, engineers emigrating to the Netherlands can benefit from the tax incentives offered to expatriates in the Netherlands. This tax advantage allows employers to provide up to 30% of an employee's gross salary as a tax-free allowance, effectively reducing the taxable income.

For instance, if an engineer's gross annual salary is €68.256, under the 30% ruling, €20.476,80 would be tax-free, and only €47.779,20 would be subject to income tax. This will apply for the first three years and decrease to 27% for the next two years. Thereafter, you would be eligible for citizenship.

The 30% tax exemption also comes with a range of other benefits, such as exchanging your South African driver's licence for a Dutch one, which can save you time and money.

Living in the Netherlands also offers a range of financial savings. For instance, Dutch residents do not spend as much on security measures as South Africans. They also pay a smaller portion of their income towards medical insurance, and children up to 18 receive free medical aid from their parents. In addition, schooling is free if the child attends a Dutch public school.

GROWING DEMAND AND INCREASED OPPORTUNITIES

The Dutch labour market is under immense pressure, having recently experienced multiple quarters with more jobs than workers. In the third quarter of 2024, there were 106 vacancies for every 100 unemployed. This labour market pressure has seen Dutch companies looking to South Africans to fill vacancies in fields such as engineering.

The number of South Africans who immigrated to the Netherlands more than doubled year-on-year, from 1.860 in 2022 to 4.200 in 2023, according to

the Centraal Bureau voor de Statistiek (CBS). While there are many financial benefits and a clear demand for highly skilled South Africans to move to the Netherlands, many engineers chose to relocate for the great work opportunities and experience, explains Ir Olav's Globetrotters South African director of operations and International Recruiter, Wendy Nelson.

Ir Olav's Globetrotters team has more than 30 years of combined experience in international recruiting. The company has assisted more than 400 highly skilled South Africans in relocating and finding employment.

"The Dutch engineering market is rapidly expanding in automation, electrical engineering and instrumentation. This creates an environment bursting with opportunities for engineers looking to get involved in future-focused projects," she said.

Nelson said these skills development opportunities are a significant drawcard for South Africans looking to increase their knowledge and learn new disciplines.

"The Netherlands is seeing growth in residential and infrastructure development, with a large emphasis on future-proofing and automating systems. Many industries are experiencing tremendous growth, and as they must comply with European Union standards, exact instrumentation is required. These are the skills you would not necessarily develop in South Africa," she said.

Nelson explained that several large companies and parastatals recruit engineers in the South African market. However, these companies seldom offer the range and scope of skills development opportunities at the numerous small and mid-size companies in the Dutch market.

ATTRACTIVE WORK-LIFE BALANCE

Nelson explained that relocation to the Netherlands is becoming increasingly popular among young families due to the excellent work-life balance and education opportunities on offer.

South African engineers seeking international opportunities may find the Netherlands an attractive destination due to its exceptional work-life balance, generous holiday benefits, high-quality education system, comprehensive social services, and a strong emphasis on safety.

The Netherlands is renowned for its outstanding work-life balance. According to the OECD Better Life Index, the country outperforms the average in work-life balance. Dutch companies often promote flexible working hours and arrangements, allowing employees to adapt their schedules to personal needs and commitments.

In addition, employees are entitled to a minimum of 20 paid vacation days per year, excluding public holidays. Many employers offer up to 25 days or more. Most employees also receive a holiday allowance, typically amounting to 8% of their annual salary, which is paid out to support vacation expenses.

The OECD Better Life Index also highlights that the Netherlands outperforms the average in safety, indicating a secure environment for residents.

The Netherlands boasts a high-quality education system, making it an excellent choice for engineers with families. The country offers a range of international schools that provide education in English and other languages, catering to the needs of expatriate families. Moreover, the Dutch education system is known for its innovative teaching methods and strong emphasis on critical thinking, preparing students for global citizenship.

For higher education, the Netherlands is home to several world-class universities offering programs in engineering and technology, providing opportunities for continuous professional development. In fact, as Dutch citizens, students in the Netherlands pay less for tertiary tuition fees than South Africans do.

YOUR RELOCATION PARTNER

Despite all the benefits of relocating to the Netherlands, choosing to move your family and navigating the complexities of immigration laws and foreign job markets can be daunting, says Ir Olav's Globetrotters managing partner Sonja Poortman.

continued from page 51

Diane van Galen Last

Sonja Poortman

Wendy Nelson

This is where Ir Olav's Globetrotters – an international recruitment company specialising in connecting professional talent from South Africa with Dutch companies – can provide information and support to ease the path for South African professionals looking to immigrate.

The company has assisted scores of South Africans in relocating and finding employment and offers various useful tools, including an e-book titled "Wanna Go Dutch?"

The digital guide provides guidance on essential topics, including the necessary paperwork, finding a new home for your family, travelling with pets, creating mock budgets, and adjusting to life in the Netherlands.

Designed specifically for South Africans, this resource offers practical tips to streamline your move and valuable insights to help you settle comfortably into your new environment.

"'Wanna Go Dutch?' is a comprehensive guide that covers every aspect of relocating to the Netherlands, drawing from the experiences of hundreds of South Africans and the expertise of the Ir Olav's Globetrotters team," said Poortman.

"It offers valuable insights, practical relocation tips, and personal stories from candidates who have undergone the process. Instead of searching through countless online forums and social media groups for advice, you now have all the essential information conveniently compiled in one accessible resource."

Ir Olav's Globetrotters has a unique offering that ensures South Africans relocating to the Netherlands receive a competitive annual salary, Dutch language lessons, and relocation assistance. The team also connects new arrivals with a network of fellow South Africans for mutual support.

Their primary focus is facilitating permanent placements in technical fields such as engineering and information technology. With years of experience relocating South African talent to the Netherlands, Ir Olav's Globetrotters has established itself as a trusted partner for job seekers and employers.

Ir Olav's Globetrotters offers a holistic approach to relocation, ensuring that candidates are well-prepared for their move to the Netherlands.

The company assists with obtaining Highly Skilled Migrant Visas and manages the administrative tasks associated with relocation. Upon arrival, they support acquiring a BSN number, opening a bank account, securing a Dutch mobile number, applying for the 30% tax ruling, and exchanging a driver's license. This comprehensive support system ensures a smooth transition for professionals and their families.

Understanding the challenges of moving to a new country, Ir Olav's Globetrotters offers mentorship during the initial months in the Netherlands. They facilitate connections with a network of fellow South Africans, organising events and gatherings to foster a sense of community. This support network helps newcomers feel at home and accelerates their cultural integration.

The recruitment process is structured to ensure a good fit between the candidate and the employer. It begins with an application through their website, followed by video interviews to discuss opportunities and expectations. Candidates then interview potential employers, which may include technical assessments. Once selected, Ir Olav's Globetrotters prepares candidates for their transition, including visa applications, housing assistance, and language lessons. They also provide ongoing mentorship during the initial period in the Netherlands.

Ir Olav's Globetrotters is dedicated to bridging the gap between South African talent and Dutch opportunities. Professionals can confidently embark on a successful career and life in the Netherlands through comprehensive recruitment, relocation support, and community integration. wn

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POPIA's Direct Marketing Guidance Note

- A NEW ERA OF TELEMARKETING COMPLIANCE

POPIA compliance is quickly becoming an area of concern for many major entities. On 5 December 2024, the Information Regulator issued a Direct Marketing Guidance Note to address the loophole associated with telemarketing, particularly concerning live, unsolicited phone calls.

By: Jodi Poswelletski and Keitumetse Khutsoane
Fairbridges Wertheim Becker

This follows after the Information Regulator issued its first enforcement notice against FT Rams Consulting for non-compliance with the direct marketing provisions of POPIA. Such an entity was found to have dishonoured data subjects' opt-out requests.

This guidance could have significant implications for engineering firms that may rely on telemarketing strategies for outreach, customer engagement, and service promotion.

BACKGROUND: THE LOOPHOLE FOR TELEMARKETERS

One of the major issues that the Information Regulator identified was the ambiguity surrounding the term 'electronic communication' in POPIA. While the Act prohibits unsolicited electronic communications for direct marketing, the definition of 'electronic communication' as "any text, voice, sound, or image message sent over an electronic communications network" creates room for interpretation.

Specifically, some telemarketers have argued that live phone calls—where no message is stored on a network—fall outside the scope of POPIA's direct marketing restrictions.

The absence of clear guidance about live, real-time calls meant that many telemarketers believed they could legally and without impunity operate in a grey area. The Direct Marketing Guidance Note has, therefore, closed this gap between the interpretation and purported purpose of section 69 and clarified that telephone calls are indeed a form of electronic communication for purposes of section 69(1)-(3) of POPIA.

CONSENT AS A LEGAL OBLIGATION FOR DIRECT MARKETING

The lack of stringent penalties for non-compliance has allowed some companies to flout these provisions without consequence—until 2024. In the same Direct Marketing Guidance Note, the issue of obtaining consent for direct marketing was further addressed and ventilated.

Obtaining proper consent is not just a best practice; it's a legal obligation. While section 69 of POPIA mandates that explicit consent be obtained from data subjects before receiving marketing communications - including telemarketing - many entities have operated within the scope of "implied" consent – which is unsatisfactory. A prime example is FT Rams Consulting, which is briefly mentioned above. On 27 February 2024, the Information Regulator issued its first 'enforcement notice' to FT Rams Consulting, a company that violated PoPIA by conducting marketing activities without securing explicit consent from individuals.

The enforcement notice required FT Rams Consulting to establish a database recording consumer consent or revocation of consent, ensuring that unauthorized contact would not occur. Such accountability is advisory for all entities and sectors, including

engineering, insofar as the handling of data subjects' personal information is concerned.

THE WAY FORWARD

With the finalization of the Direct Marketing Guidance Note, many aspects of direct marketing have been clarified for the public. While the Guidance Note is not legally binding but rather advisory in nature, companies found to be non-compliant with its provisions face punitive measures of up to R10 million or imprisonment of up to 10 years. The evolving legal landscape surrounding telemarketing and data protection should not be ignored. Taking proactive steps—such as securing clear consent, monitoring data usage, training employees on POPIA, and understanding the nuances of telemarketing within POPIA—will be key for the engineering sector and will strengthen client relationships in an increasingly privacy-conscious world.

The Direct Marketing Guidance Note further addressed direct marketing under the scope of having a "legitimate interest", which will be ventilated in the next issue. wn

The Lure of Digital Transformation

I wrote that rhyme and delivered it at a mines and technology conference in 2018 when digital transformation and Industry 4.0 were breaking onto the scene and being lauded as the solution to our decarbonisation challenges.

BY: Andrew Cooper Pr.Eng, MBA, CEM, CPEnMS, CIEP, 50001 CP, CMVP, CRE
Senior Consultant
SYNERGISE
LinkedIn – andrewcooperenergy

"AI, Machine Learning,
Advanced Automation,
We're in an era of digital transformation

IoT, Big Data, Cloud Computing
Technology's evolving;
there's no disputing

As we dive headlong into Industry 4.0
Autonomous Vehicles and Robotics are the way to go

Blockchain, Neural Networks and Python Scripts
Cyber Security's a challenge,
so keep your wits

Analytics, simulations and digital twins,
What a crazy, fast-paced world we're in

Throw virtual reality into the mix
Your brain's in a whirl;
you're in a fix

The pressure builds and starts to squeeze
Take a step back, relax and breathe."

Fast-forward six years to 2024, when I was speaking and chairing an international energy conference. The sessions on AI were held in the standing room only. AI was being lauded as the solution to our decarbonisation challenges.

Don't get me wrong—I am a big supporter of technology and digital transformation. It can unlock additional value, help identify energy waste, optimise energy performance without significant cost, and help integrate energy management into day-to-day operations.

However, it needs to be part of a more significant decarbonisation strategy. Here's why...

A few years ago, I was working on a study with a tech company to develop neural networks and machine learning models for a mill concentrator.

The objective was to determine the optimal combination of operational parameters to minimise energy use and maximise the output of the grinding circuit and a filter press for drying concentrate. We had been collecting mill operation and energy data for over a decade, so data availability should not have been a problem, right? Wrong...

The filter press system was pretty straightforward, and we fairly easily determined the optimal operating conditions to minimise energy (compressed air use) and still meet moisture requirements. It was a win, for sure. The grinding circuit, the biggest

energy-consuming piece of equipment at the mine, was a different beast.

With so many factors affecting grinding performance and modifications to water addition points over the years, we just did not have all the required data points.

For the data we did have, there were instances when some equipment had gone out of calibration or failed and had to be repaired or replaced. Those periods of data had to be removed in the data clean-up process.

Ultimately, a decade of data was barely enough for the machine learning models.

The good "clean" data was for parameters that were essential to managing the process, so a system was in place to ensure instruments supplying that data were quickly repaired.

The point here is that AI, machine learning, and advanced automation have to be supported by a system to collect, maintain, and ensure the integrity of the required data. We'll get back to this shortly.

The other trend I noticed at the conference was the increased focus on systems, primarily ISO 50001 (an international standard for energy management), to support decarbonisation objectives.

This was encouraging as a systematic, company-wide approach to decarbonisation is the only way we will get there. An added benefit is that a system like ISO 50001 can also provide a framework to support your data-driven technical initiatives by helping to:

- Determine data requirements and how that data will be collected.
- Develop systems and processes to ensure data integrity.
- Improve energy performance and reduce greenhouse (GHG) emissions simultaneously.

What was true in 2018 still holds true today. Instead of rushing headlong into some technological marvel to address your decarbonisation objectives, focus on building the necessary systems and processes to support that technology. You will have a far greater probability of achieving the outcome you are looking for.

Do it, but take your time to do it properly and don't get caught up in the hype.

Do I recommend that you embark on a digital transformation journey? Absolutely. Not because you fear being left behind or because of the pressure suppliers and the media will put on you, but because it will help you unlock value by minimising waste and optimising efficiency.

Just remember... when the pressure builds and starts to squeeze, take a step back, relax and breathe. wn

IITPSA thought leaders urge greater skills development focus

Board and committee members of the Institute of Information Technology Professionals South Africa (IITPSA) and Professional CIOs (Pr.CIOs) have welcomed the acknowledgement of the importance of digital technology in President Cyril Ramaphosa's State of the Nation address, but have called for more focus on digital skills development.

In his recent address, the President noted that technology could transform the way that government works, and committed to investing in digital public infrastructure to give South Africans access to government services.

He said: "At the heart of this transformation will be the implementation of a digital identity system."

The President said investment would be made in a world class digital forensics lab to support investigations into corruption and financial crime.

He also highlighted plans for an Electronic Travel Authorisation system to enable a fully digital visa application process, and noted the need to build the industries of the future – including the digital economy. "To support growth in digital services and business process outsourcing, we are investing in skills development for the industries of the future," he said.

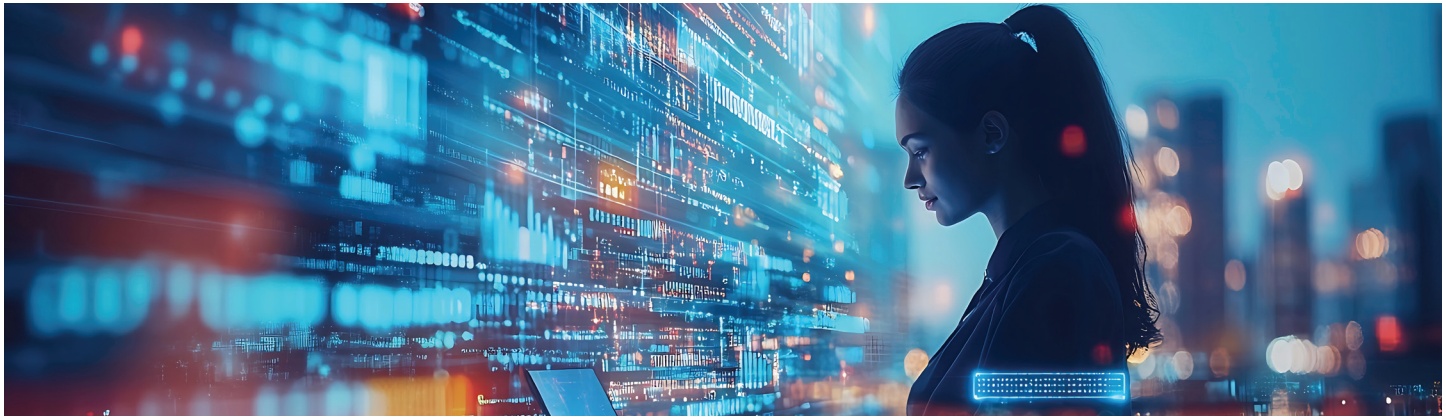
PRACTICAL APPLICATIONS AND INTEGRATED APPROACHES A WELCOME DEVELOPMENT

IITPSA Pr.CIO and Founder & CEO of eTSHADI Consulting Services Dr Sylvia Sathekge welcomes the emphasis on technology throughout the SONA 2025 address.

She says: "The repeated mentions of 'digital,' 'technology,' 'innovation,' 'AI,' and 'modernisation,' and related terms underscore a clear understanding that South Africa's future prosperity hinges on embracing digital transformation. Beyond simply acknowledging its importance, the address outlines concrete initiatives where technology plays a central role: from streamlining government services through digital infrastructure and identity programmes, to modernising key sectors like mining and healthcare with digital platforms and analytics."

She adds: "The commitment to harnessing technology to improve infrastructure (rail systems) and boost related sectors like tourism signals a welcome shift towards practical application. As a technology thought leader and digital transformation specialist, I find this integrated approach encouraging, particularly the focus on digital skills development and the creation of a transformation fund to empower innovation. Crucially, this must be coupled with robust digital skills development programmes to empower citizens to participate in the digital economy. Furthermore, as we embrace these technologies, cybersecurity must be a paramount concern, requiring proactive strategies and investment to safeguard our digital infrastructure and data. However, the success of these ambitious plans will depend heavily on robust governance and oversight, as rightly emphasized in the address, to ensure responsible implementation and maximise the benefits for all South Africans."

IITPSA CEO Tony Parry echoes the importance of skills development. He notes: "The 2024 IITPSA ICT Skills



Survey and Research Report notes that 'There is growing pressure on training institutions and employers to develop the ICT skills of graduating students and employees to meet the skills demand of the industry in the face of the changing technology landscape."

"At this point in time, it is important that we look, not only at investment in skills development in respect of new talent entry and new industries in the SA digital economy, but also the need to cross-skill/upskill/re-skill some of the existing talent already active in the economy – and, as noted in the IITPSA ICT Skills Survey this includes the basic digital skills needed to use digital tools to execute simple daily tasks," he says.

On digital job creation, IITPSA Fellow and PMIITPSA Adrian Schofield notes: "The South African government needs to recognise that long-term economic growth requires mass employment opportunities for young people as they leave the education environment. Employment does not necessarily mean becoming a staff member of an enterprise - it can include self-employment as an entrepreneur using the technologies of the 2020s. The lack of meaningful progress in broadening the take-up of STEM subjects at schools and beyond means that we are stifling our capacity to feed South Africans into the skills pipeline that the President's technology-based projects will desperately require."

CALL TO ACTION FOR CIOS

Pr.CIO and BGPAfrica CEO Mervyn Goliath describes the President's commitment to leveraging technology for economic growth, digital transformation, and infrastructure development as a call to action for every CIO and CTO in South Africa.

He says: "As leaders in the digital and technology space, we have a responsibility not just to embrace this vision but to actively drive the change needed to make it a reality. At BGPAfrica, we are already engaged in strategic projects with leading corporations across mobile, retail, and global system integration - and we can see how these programmes of work at our current clients complement the President's vision - these are industries that stand to benefit significantly from the promise of a digitally-enabled future. The emphasis on digital public infrastructure, skills development, and unlocking investment creates an environment where technology leaders must rally together to turn policy into progress.

We are encouraged by the momentum and excited to continue working with our current and future clients to ensure that these opportunities translate into real, tangible impact. As proud members of the IITPSA, we commend this initiative to unpack the SONA and drive constructive dialogue. The future of South Africa's digital economy is being shaped today, and we must be at the forefront of making it a success."

PROTECTING DIGITAL IDENTITY

Commenting on plans for a national digital identity system, John Singh, Vice President of the IITPSA and Chairperson of the IITPSA Blockchain and Crypto SIG, says: "This will be core to the technological transformation of the government. The enablement of blockchain-based digital identifiers would allow citizens to have one cryptographically secure identifier that they could use across a range of e-services. 'Zero knowledge proof' technology is a key component for data protection and privacy, as it will allow citizens to prove their identity without revealing sensitive information about themselves."

UPSKILLING CRITICAL FOR AI-ENABLED GOVERNMENT

Bryan Baxter, member of the IITPSA Cyber Security Special Interest Group (SIGCyber), says: "Artificial Intelligence can help to digitise government services, create jobs, and drive economic growth. It can streamline public services, making it easier and faster for citizens to access key services. This includes applying for permits, managing digital identities, or interacting with the government online. This would enable greater efficiency, and a more responsive public sector. Reskilling and upskilling the government workforce will be critical. The government should invest in AI training programs and digital skills development."

Baxter cautions: "Just as technology innovation provides new opportunities, it also has risks. All new technologies should be implemented securely. Cyber Criminals are also exploiting AI. They will be actively looking to take advantage of potential vulnerabilities in any new governmental services.

continued from page 59

Robust cybersecurity defences will be critical to ensure the resilience of a digitised government and to protect citizens' confidential data."

FOCUS ON THE ROLE OF WOMEN

Thenzie Stewart, chair of the IITPSA's Women in IT (WIIT) Chapter, says: "WIIT acknowledges the government's commitment to digital public infrastructure and modernisation. However, we note that no concrete initiatives were highlighted on the role of women in technology, STEM, and how we can add value to the government's digital transformation journey," she says.

"The alarming decline in mathematics and science performance, particularly among young women, remains a critical concern. This decline threatens the pipeline of women entering STEM careers, leaving them at a disadvantage in the digital economy.

Additionally, the lack of awareness surrounding data protection laws, as noted during Data Privacy Week, further exposes women and girls to risks in both career opportunities and digital safety. To close this gap, we must invest in STEM education, promote digital literacy, and create safer online spaces for women, ensuring they are equipped to lead and innovate in the tech-driven future."

Moira de Roche, non-executive director of the IITPSA and chair of IFIP IP3, believes foundational maths is crucial for STEM and digital progress. She says South Africa needs to focus more on maths education and educators in school, and use AI in teaching.

Stewart adds that the government's investment in a digital identity system and modernisation of services presents an opportunity to drive inclusive transformation.

"However, ensuring these advancements are accessible to women aspiring to enter STEM fields is essential. Collaboration between the government and organisations like WIIT can play a crucial role in developing targeted programs that encourage and support women in STEM careers. This includes funding scholarships, facilitating mentorship opportunities, and launching awareness campaigns to inspire young women," Stewart says.

"By working together, we can bridge the gender gap in STEM, ensuring that women are not only beneficiaries of technological advancements but also active contributors to South Africa's digital future. WIIT is committed to partnering with government and industry stakeholders to empower women in tech, shaping a more inclusive and innovative digital economy." wn

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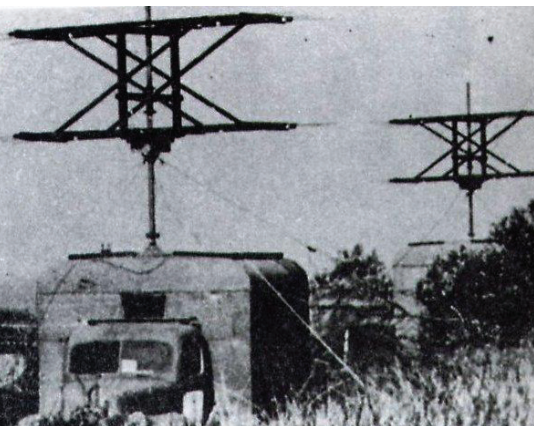
SIEMENS

Basil Schonland and Stanley Hey



In February 1942, a young physicist, Stanley Hey, found himself saddled with a task that seemed, on the surface, to be extremely mundane. At the time Hey was working in the British Army Operational Research Group (AORG) under the command of Colonel Basil Schonland, FRS. Schonland, a South African physicist, had a world-renowned reputation as an expert on radio detection of lightning.

By: Brian Austin
Retired from the Department of Electrical Engineering and Electronics, University of Liverpool.

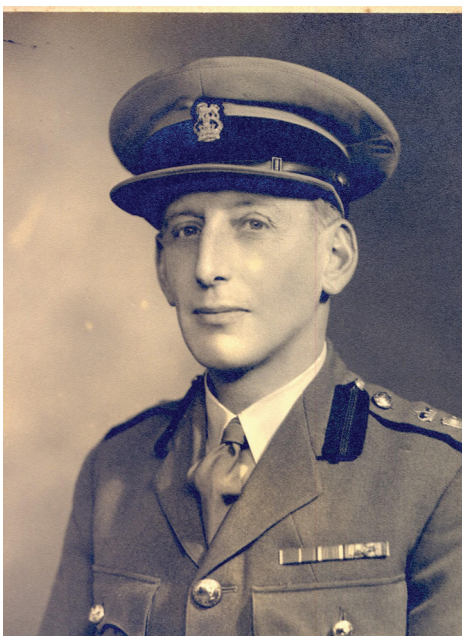
Soon after South Africa entered the war in September 1939, he formed a highly-secret group at the University of the Witwatersrand in Johannesburg with the intention of building an elementary radar in order, as Schonland put it, to 'learn the technique'. Within three months they had succeeded and their 90 MHz radar received its first echoes.

SIR BASIL SCHONLAND, FRS.

In 1941 Schonland went to England on a mission to increase the supply of British radars to South Africa. He never returned home because his services were in great demand by Professor John Cockcroft, then running the Air Defence Research and Development Establishment (ADRDE).

He needed a deputy and he appointed Schonland. The ADRDE became the Army Operational Research Group (AORG) and among the many physicists who applied their minds to the problems of modern warfare was Stanley Hey.

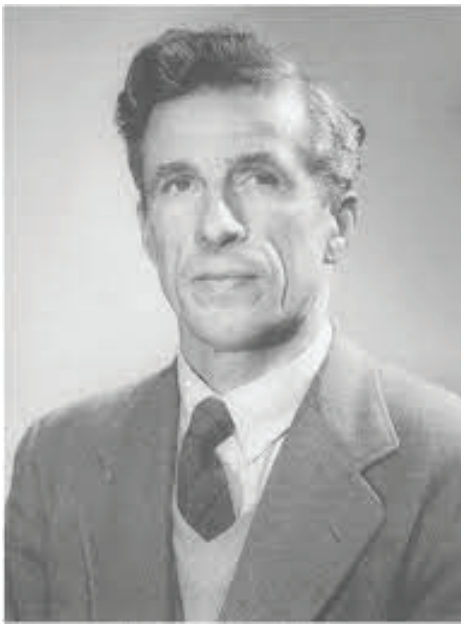
During the night of 11/12 February 1942 three German battlecruisers, Scharnhorst and Gneisenau and the heavy cruiser Prinz Eugen made a daring escape from the French port of Brest where they had been undergoing major repairs. By dint of brilliant seamanship, and with the help of murky weather, they made it through the English Channel to their home ports in Germany undetected by British radars. The Germans had been ramping up their jamming of those coastal defence radars in a very controlled way over a period of weeks so as not to alert the enemy to the increasing broadband noise. This audacious German naval action and the inability of British forces to prevent it has become known as the Channel Dash. Schonland's AORG was ordered to take control of all coastal defence radars and Hey was assigned to the task of tracing the source of the jamming.



Sir Basil Schonland, FRS.

STANLEY HEY

He set up what was called the J Watch, involving logging and reporting all interference with the radars. Over 26/27 February severe jamming was experienced. Intriguingly, it subsided completely at nightfall. And the source was apparently moving. To some this suggested an airborne jammer but Hey soon deduced that there was another far more likely source: It was the Sun because a massive sunspot group had been transiting the solar disc on those days, and therefore the 'jamming'



Stanley Hey

was actually the noise from this solar storm. Hey immediately reported this to Schonland. 'Is that so, Hey?',

said Schonland. 'How interesting. Did you know that Jansky of Bell Labs in the USA discovered radio noise coming from the Milky Way?' Schonland then told him of Jansky's work in 1932 which had very much underwhelmed the American astronomy community at the time, though its subsequent ramifications were huge.

Restrictions prevented Hey from publishing his findings till after the war. But that did not deter the sceptics among his own colleagues who loftily informed him it was well-known that the Sun was a thermal source radiating according to Planck's law. How wrong they would soon prove to be ! Hey's discovery was undoubtedly the beginning of radio astronomy in the UK. wn

Further information may be found in:

- *Austin, B.A., 'Radar in WW2: The South African contribution', IEE Engineering Science and Education Journal, June 1992.*
- *Austin, B.A., Schonland; Scientist and Soldier, Taylor and Francis, 2001.*
- *Hey, J.S., Solar radiations in the in the 4-6 metre radio wave-length band, Nature, Vol.157, pp47-48, 12 January 1946.*
- *Hey, J.S., The Evolution of Radio Astronomy, Elek Science, London, 1973.*

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MEMBERSHIP FEES EFFECTIVE 1 DECEMBER 2024

The Council meeting held on 6 September 2024 approved subscription & entrance fees as from 01 December 2024 as per schedule indicated below.

PLEASE NOTE: In terms of Bylaw 3.2 annual subscriptions are due on 1st December 2024

MEMBERSHIP FEES CAN BE PAID IN MONTHLY RECURRING PAYMENTS

Council agreed to a discount for fees paid before 31 March 2025. Members are therefore encouraged to pay promptly to minimize increase impact.

Grade of Membership	Annual Subscriptions paid before 31 March 2025		Annual Subscriptions paid after 31 March 2025		New Members FEES * see Notes 1 & 4 below.	
	RSA incl VAT (R)	Outside RSA excl VAT (R)	RSA incl VAT (R)	Outside RSA excl VAT (R)	RSA incl VAT (R)	Outside RSA excl VAT (R)
Student	nil	nil	nil	nil	nil	nil
After 6 yrs study	1 890	1 644	2 268	1 972	2 268	1 972
Associate	1 890	1 643	2 268	1 972	2 268	1 972
Member	2 089	1 816	2 507	2 180	2 507	2 180
after 6 years	2 441	2 122	2 929	2 547	2 929	2 547
after 10 years	2 555	2 221	3 065	2 666	3 065	2 666
Senior Member	2 555	2 221	3 065	2 666	3 065	2 666
after 6yrs/age 40	2 768	2 407	3 322	2 889	3 322	2 889
Fellow	2 768	2 407	3 322	2 889	3 322	2 889
Retired Member (By-law B3.7.1)	1 174	1 021	1 409	1 225	n/a	n/a
Retired Member (By-law B3.7.3)	nil	nil	nil	nil	n/a	n/a

1. The fee for all new applications is R3457.00 which includes an entrance fee of R950.00. On election to the applicable grade of membership the new member's account will be adjusted accordingly and refunds/additional payment made on request.

2. Transfer fee to a higher grade is free for all grades of membership.

3. Members are encouraged to transfer to a higher grade when they qualify. It will be noted that the fees of Member and Senior Member grades after 10 and 6 years respectively are equal to the fees at the next higher grade.

4. Members elected after May 2025 pay a reduced subscription fee.

5. By-law B3.7.1 reads “Where a member in the age group of 55 to 70 years has retired from substantive employment in the engineering profession, such member may make written application to Council for recognition as a retired person and a reduced membership fee".

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

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

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

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

10. The members monthly magazine ("wattnow") is available on line and members who require a hard copy may acquire same on request and for a nominal fee subject to minimum uptake numbers.

11. Members who wish to pay their membership fees in recurring payments should activate the payments on their banking portal. Members will receive the early bird discount only if their fees are fully paid by 31 March 2025.

2025 SAIEE MEMBER BENEFITS

STUDENT MEMBER	ASSOCIATE MEMBER	MEMBER	SENIOR MEMBER	FELLOW
Jobs portal for WIL	Jobs portal access	Jobs portal access	Jobs portal access	Jobs portal access
Mentorship	Mentorship	Mentorship	Services Directory	Services Directory
Exclusive Networking Events	Exclusive Networking Events	Exclusive Networking Events	Mentorship	Mentorship
CPD training discounts	CPD training discounts	CPD training discounts	Exclusive Networking Events	Exclusive Networking Events
Charge Reward Programme earnings	Charge Reward Programme earnings	Charge Reward Programme earnings	CPD training discounts	CPD training discounts
Bursary programme	Bursary programme	Long standing member gifts	Charge Reward Programme earnings	Charge Reward Programme earnings
Publication access (**watt**now & ARJ)	Publication access (**watt**now & ARJ)	Bursary programme	Long standing member gifts	Long standing member gifts
Site visits	Site visits	Publication access (**watt**now & ARJ)	Bursary programme	Bursary programme
SAIEE Centres	SAIEE Centres	Site visits	Publication access (**watt**now & ARJ)	Publication access (**watt**now & ARJ)
		SAIEE Centres	Site visits	Site visits
			SAIEE Centres	SAIEE Centres
			Eligibility for nomination as Center Chair	Eligibility for nomination as Center Chair
				Eligibility for nomination as an Office Bearer

MEMBERSHIP UPGRADE DISCOUNT STRUCTURE

LENGTH OF MEMBERSHIP	DISCOUNT UPON UPGRADE
10 - 19 years	5%
20 -39 years	10%
40+ years	15%

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Building Services	A Chivaurah	bssection@saiee.org.za
Electronics & Software	R van Heerden	essection@saiee.org.za
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CHAPTER CHAIRPERSONS:

Cybersecurity Chapter:	M Taljaard	csc@saiee.org.za
Entrepreneurship Chapter:	Y Mabuto	entrepreneurchapter@saiee.org.za
Financial Chapter	M Mdala	financialchapter@saiee.org.za
Lightning Chapter	H Hunt	lightningchapter@saiee.org.za
Load Research Chapter:	M Dekenah	lrchapter@saiee.org.za
Nuclear Chapter:	D Nicholls	nuclearchapter@saiee.org.za
Railway Chapter	R Kopa	railwaychapter@saiee.org.za
Women in Engineering:	M Phoshoko	wie@saiee.org.za

Eastern Cape Centre
Chairman | Philip Nicholson
E | ecc@saiee.org.za

Free State Centre
Chairman | Lucky Mokalusi
E | fc@saiee.org.za

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E | cgc@saiee.org.za

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E | kznc@saiee.org.za

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MARCH 2025

03/03/2025	Fundamentals of Medium Voltage Protection
05/03/2025	Fundamentals Of Practical Lighting Design for Commercial and Industrial Application
05/03/2025	WW 2: Profitable Small Wind Turbines
12/03/2025	Design Thinking and Innovation for Engineering Professionals
14/03/2025	2024 SAIEE Annual Awards - BOOKINGS CLOSED
19/03/2025	FIDIC Tendering and Contracts for Engineers
19/03/2025	Unveiling the pursuit of the Steam Generator Replacement (SGR) Project at Koeberg Power Station
20/03/2025	SAIEE Financial Chapter launch
20/03/2025	Hydrogen for a Sustainable Tomorrow: A Case Study in Ethekwini Municipality
25/03/2025	Finance Essentials for Engineers
26/03/2025	Photovoltaic Solar System
27/03/2025	SAIEE AGM

APRIL 2025

02/04/2025	WW 3: 2nd Life Refurbished Turbines
08/04/2025	An Introduction to Artificial Intelligence for Professionals
09/04/2025	Power Systems Protection
15/04/2025	Substation Design & Equipment Selection
15/04/2025	Power Transformers: Fundamentals and Life Cycle Management Principles Course
29/04/2025	Incident Investigation and Management (Root Cause Analysis)

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