wattnow

SAIEE THE OFFICIAL PUBLICATION OF THE SOUTH AFRICAN INSTITUTE OF ELECTRICAL ENGINEERS | JULY 2023

COMMUNICATION

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 in many countries worldwide.

Training Academy

We offer CPD training courses, a powerful learning tool to improve skills, ensuring that academic qualifications do not become outdated.

Skills Development

One of our core objectives is to harness and foster the growth of Education in the Engineering sector, which has been faced with a debilitating shortage of skills.

Corporate Forums

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

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

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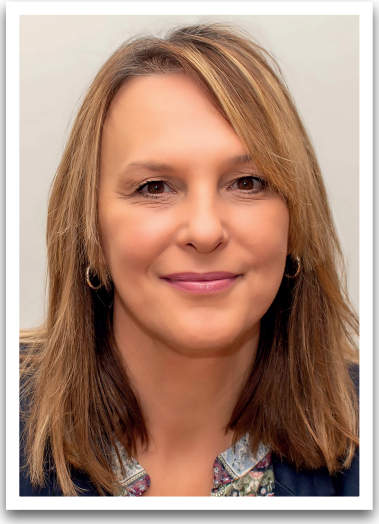

Dear **watt**now reader,

In 1965, after technological advancements, including communication changes, made collaboration and work more efficient than ever before, a Senate subcommittee predicted that by 2000, Americans would work just 14 hours per week. They foresaw technological advancements upending the landscape of work — how, when, and where we do it, and which skills would be most important to executing it.

Today, while frontline workers do essential, location-based work, "knowledge workers" — people for whom physical workspace is less important — function very differently than they did in the past. Remote and hybrid work options and a cultural shift toward better work/life balance have altered the work landscape.

Amid this shift, which skill is more essential than ever for productivity, efficiency, collaboration and personal success? Communication.

Our first feature article looks at how ChatGPT will drive Chatbots in 2023. Chatbots are AI computer programme that uses techniques designed to simulate conversational interactions with human users, which may also include automated processes triggered by these interactions. Read it on page 26.

Cybersecurity works hand in hand with today's communication channels, with online payments being a large target for fraudsters. This is because there are millions of loopholes to exploit, such as card details being stored digitally for eCommerce, and page 30 features an article on "Combatting online payment fraud".

Page 36 gives you an overview of the Technology and Innovations Report 2023. This report argues that the wave of technological change unleashed by renewable and other green technologies opens new windows of opportunity for the Global South to build resilience against threats, grow stronger and more diversified economies and move to better development trajectories with a smaller burden for the environment.

The August issue features Manufacturing, and the deadline is 21 July 2023. Please send your paper/article to: minx@saiee.org.za.

Herewith the July issue; enjoy the read!

Motors I Automation I Transmission & Distribution I Energy Systems I Electrical Construction

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2023 SAIEE Membership Benefits update

DEAR SAIEE MEMBER,

With great excitement, I am writing this letter to update you on the recently approved membership benefits. The SAIEE Council meeting of 5 May 2023 approved a tabled report on the stratified membership benefits, allocating benefits according to grades and addressing known membership complaints. This also talks to our strategy document, which specified some shortfalls in our current operating model, and this effort sets out to address those shortfalls.

The changes herein aim to set out compelling reasons to become an SAIEE member and why members should upgrade to the next membership grade when they are eligible to:

- First and foremost, the fee payable to upgrade to the next membership grade, once eligible to do so, has been scrapped. Effective immediately, there is no cost to upgrade, which augers well with members eligible to upgrade and who are already paying the next grade's fees.

- Secondly, not only has the upgrade fee been scrapped, but you will also receive/get a once-off discount on your annual fees on the year you upgrade. The quantum of the discount is dependent on the number of years that you have been a member of the institute. Below is the table that depicts the quantum of the discount you will receive upon upgrade.

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

- We will implement a jobs portal wherein members can browse available positions within various Corporates and Corporate Partners. This will be ideal for you if you are looking for that long-time coming change in your career. Together with job listings, Work Integrated Learning (WIL) opportunities for Student members will also be listed on the portal.

- We are establishing a free mentorship program wherein qualified and experienced SAIEE members will provide a mentorship service to SAIEE members who require it. This offer will be exclusive to SAIEE members.

- SAIEE members who are service providers can list their areas of specialization and offerings on the SAIEE Services Directory, which will be accessible to the wider public. This will be a free service to market your business/ services as a service provider.

- Every quarter, we will host an SAIEE Technical Talk (ST-Talks) event featuring a topical subject and an impactful presenter/speaker. We will host these in a hybrid format to enable those out of town to attend. These events will address a need which is the very essence of the objective of our voluntary association: Networking.

- Since we are always looking to provide you with improved benefits, SAIEE members who attend courses offered by the SAIEE Training Academy will get Charge reward points.

- SAIEE members will receive a gift every time they celebrate a decade/multiple decades of SAIEE membership. Once implemented, the gifts will not be backdated.

- SAIEE members will have access to international journals, which the SAIEE will get access to. This will be a great way to keep you as a member abreast of technology and information.

- When calling for bursary applications, SAIEE members and their immediate family will be given preference on SAIEE-provided bursaries. This benefit excludes bursaries managed on behalf of third parties.

The table on the next page shows the approved benefits.

We will embark on the modernization and digitization of the SAIEE starting in the current year. The above-stratified membership benefits will be implemented into the website as part of the digitization project, which is envisaged to be completed in 2024. Upon completing the project, you can exercise those benefits as a member in a refreshingly different environment.

LEANETSE MATUTOANE | CEO | SAIEE

2023 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%

SAIEE

Become a member today and start earning the rewards!

The South African Institute of Electrical Engineers | T: 011 487 3003 | www.saiee.org.za

INDUSTRY AFFAIRS

SAIEE President's Invitational Lecture

From left: Prof Jan de Kock (SAIEE President), Pascal Motsoasele (SAIEE Deputy President), Leanetse Matutoane (SAIEE CEO) and Machiel Viljoen (2023 President's Invitational Lecturer).

SAIEE President, Prof Jan de Kock invited Mr Machiel Viljoen, a Corporate Consultant at Eskom's Generation division for electrical generation systems as the 2023 President's Invitational Lecturer. Mr Viljoen opened the discussion and askedt he audience "is a power blackout possible in South Africa?".

A power system blackout is generally regarded as ranking amongst some of the most daunting disaster conditions – and yet one of the most predictable and even anticipated events.

A popular point of view, held by much of the popular media, is that a blackout in South Africa is inevitable – especially given the reality of ongoing load shedding brought about by the poor performance of an ageing fleet of power stations. In addition, major blackouts occur every so often globally, with no sign of abating. In fact, in the previous year, various international large-scale blackouts interrupted power to hundreds of millions of people – with Bangladesh and Pakistan being amongst the worst.

ABOUT THE SPEAKER

Machiel Viljoen obtained a bachelor's in electrical engineering from the University of Pretoria in 1991. Following this, he started working as an engineer-in-training with Eskom's Generation division.

He has worked in various roles and capacities at power stations, consistently focusing on emergency planning and preparedness and regulatory power station compliance.

Machiel received a master's degree from North-West University in 2013 on power system disruption through a cascade collapse of generation. He has presented various papers at Cigré and IEEE conferences regarding cascade failure of power generation and enhancements in the management practices employed in dealing with this threat category. Machiel is a professional engineer registered with the Engineering Council of South Africa, a member of Cigré and the IEEE, and a fellow of the South African Institute of Electrical Engineers.

Watch the 2023 PIL here.

Vertiv Enhances Its Three-Phase UPS Channel Offering in EMEA

Vertiv (NYSE: VRT), a global provider of critical digital infrastructure and continuity solutions, has announced key enhancements to its dedicated offering for channel distributors and resellers. According to Omdia, Vertiv is already ranked #1 in the three-phase UPS market globally, capturing 16% of the market. With these enhancements, Vertiv's highly-efficient and market-leading three-phase uninterruptible power supplies (UPS) from 10 to 60kVA, including the Vertiv™ Liebert® ITA2 and its complementary services, are now available in the Vertiv Solution Designer tool and shipping from stock in Europe, Middle East and Africa (EMEA).

According to Omdia's UPS Hardware Market Tracker and Analysis 2022, there's an increased demand for three-phase UPS in EMEA from markets outside of cloud, colocation, and telco. These include retail, wholesale, healthcare, manufacturing and other industries. By 2026, the three-phase UPS market in EMEA is expected to grow from $1.66B in 2021 to $2.07B, a CAGR of 5.84%.

"Digitalisation is being leveraged by companies of all sizes and industries, which leads to an increased need for efficient solutions to protect small and medium sites against power outages," said Karsten Winther, EMEA president at Vertiv. "The strategic addition of three-phase UPS to our IT channel portfolio allows partners to serve a broader market with industry-leading solutions, enabling businesses to leverage the latest technologies and accelerate their digital transformation journey."

"As an official Vertiv partner and system integrator for over 30 years, we are seeing more and more opportunities for three-phase UPS systems," said Ronald Lagerberg, team leader Energy Solutions at Endenburg Elektrotechniek. "The extension of Vertiv's IT channel portfolio expands our options, enabling us to gain substantial logistical, administrative, and financial advantages while enhancing our ability to serve end-users. We look forward to integrating these cutting-edge products into our offerings."

The Vertiv™ Liebert® ITA2 features a true online double conversion technology, a unity power factor and an extremely compact rack/tower design. Compared to single-phase systems, three-phase UPS allow higher power capacity and up to 99% efficiency in ECO mode. With the offering, expert support on product selection, set-up and performance optimisation throughout three-phase systems' entire life-cycle is now available also through the channel market. In fact, Vertiv's three-phase UPS offering is enhanced with customised on-site and contract services specifically designed for the channel, while also leveraging the company's top-tier service network.

Having a large portfolio of UPS solutions dedicated to the channel market means that partners have access to a wide range of power protection options, including medium power solutions that allow businesses to expand their digital footprint while still working with their trusted channel partner. Vertiv provides a comprehensive range of specialised services designed to complement channel partners' business models. The extensive service expertise offers a smooth experience for all parties involved, providing seamless support across Vertiv's entire service offering, including on-site services, lifecycle services and digital services such as remote diagnostics and incident management. Moreover, partners can leverage Vertiv™ software solutions to empower asset management capabilities and offer the best experience to their end users.

In addition to UPS systems, Vertiv's broader critical infrastructure portfolio is designed to operate more efficiently, increase capacity and potentially lower TCO while integrating seamlessly with the customer's existing infrastructure, enabling partners to expand revenue streams and increase margins. With manufacturing facilities across Europe and the world, Vertiv solutions can be made available when and where they are needed.

Partners can also access dedicated configuration tools linked with an ecosystem of technical and commercial support teams. Vertiv's multi-award-winning Partner Program features benefits and incentives to equip, develop and reward partner engagement. The addition of the Liebert ITA2 UPS to Vertiv's IT channel portfolio also enables EMEA resellers in participating countries to earn more points through the Vertiv Incentive Programme (VIP), which allows partners to easily earn rewards without the need for any reporting. Bonus points are uploaded into the Vertiv Partner Portal monthly, and the partner only needs to log in to redeem them. wn

INDUSTRY AFFAIRS

ACTOM takes over manufacturing facility in Kenya as it seeks to expand into the East African region.

ACTOM, a market-leading supplier of electrical equipment and services, will take over a low-voltage product manufacturing facility in Kenya from existing technology partner Schneider Electric – a move that will facilitate ACTOM's industrial expansion into East Africa.

ACTOM CEO, Mervyn Naidoo, explains that the company is planning to establish industrial hubs in East, West, and eventually even North Africa that will provide a platform for the broader ACTOM portfolio of products and services in these regions.

Its takeover of the Kenyan manufacturing facility will provide the company with an entry point into East Africa, where it plans to target the Tanzania, Uganda, Rwanda, and Ethiopia markets. Naidoo says that ACTOM has an extensive range of Intellectual Property (IP) in low-, medium-, and high-voltage products. These span a wide spectrum of transmission and distribution products, as well as power generation and associated products.

"We intend to use the industrial platform in Kenya to enter the East African market with our products and services. We want to expand to Kenya, where we will transfer IP and, where economically feasible, set up manufacturing and establish our repair business there," says Naidoo.

"This will be a platform for the broader ACTOM group to not only enter the East African market but also to embrace East African economies where we will employ people and use our IP to get actively involved, thus also growing both ACTOM South Africa and ACTOM Kenya."

He notes that the African Continental Free Trade Area (AfCFTA) presents numerous opportunities for intercontinental trade, especially within the economies of countries like Kenya and Tanzania, which are growing at 4%-plus annually.

"Based on this, we expect that there will be significant demand for our products. As such, we plan to transfer our full scope of products and services into the African markets. Our offerings will be linked to demand, with demand in the region driving the prioritisation of what goes into the market first. The intention is to gradually increase our offering," says Naidoo.

ACTOM celebrates its 120th anniversary this year and currently manufactures products that range from boilers to control equipment, uninterrupted power supplies, LED lighting, solar heating systems, transformers, switchgear, and turnkey EPC solutions. The company also provides full aftermarket repair and service solutions to its customers.

"By offering repair and service solutions, we can ensure the sustainability of our products, literally from cradle to grave. It would be fruitless having products that cannot be serviced; hence throughout the full lifecycle of the product, we can provide support and optimise lifecycle costs and availability. In this way, we can maximise availability and performance for our customers," says Naidoo.

Speaking on the partnership, Carol Koech, Country President at Schneider Electric in Kenya says that the move to transfer the manufacturing and assembly plant in Kenya to ACTOM allows Schneider Electric to focus on positioning the company with key technology partners, as it continues to strengthen its strategic ambition to prioritise its digital offerings, software, and services to in turn enhance its service offering to its customers.

Mervyn Naidoo | ACTOM CEO

"The move allows Schneider Electric to focus on expanding its reach in Eastern Africa, commercialising more offers, and growing its partner network to serve its customers with more technology and competitive value," says Carol.

SABS

Whistleblowing **SANS 37002**

Every South African company should have a whistleblowing management system

The South African Bureau of Standards (SABS) has published South African National Standard (SANS) 37002 Whistleblowing management systems — Guidelines. This document provides the framework and guidelines for any organisation to implement a whistleblowing management system based on the principles of trust, impartiality, and protection.

"Whistleblowing has the potential to prevent and eliminate corruption, fraud and illegal or wrongful acts that can save companies millions of rand. The act of whistleblowing can be daunting and life threatening in some cases, and it is important that organisations are cognisant of the need to design systems that can protect the identity of whistleblowers," says Sadhvir Bissoon, Acting CEO of the SABS.

Bissoon explained that the guidelines contained in SANS 37002 is generic and intended to be applicable to all organisations, regardless of type, size, nature of activity, and whether in the public, private or not-for profit sectors. The document is adopted from the International Organization for Standardization (ISO) and is the internationally accepted standard for organisations, anywhere in the world to deal with whistleblowing.

The document includes guidelines on how to reduce and prevent detrimental treatment of whisleblowers and others involved, demonstration of leadership commitment to prevent and address wrongdoing, encouraging people to blow the whistle and establishing a culture of openness, transparency, integrity, and accountability. A practical framework for receiving, assessing, addressing and concluding whistleblowing cases are also included.

Organisations can email info@sabs.co.za if they would like to receive training on SANS 37002 or visit the SABS webstore to purchase a copy of the national standard. wn

INDUSTRY AFFAIRS

From wine to wind turbines, FUCHS plays a key role in the Western Cape

From left: Bradlee Fillies, Celeste Tickner, Bertie Brand, Nicholas Coetzee, Ernst Bekker, Sedick Connelly.

The Western Cape represents a rich tapestry of industrial activity in South Africa. It is home to original equipment manufacturers (OEMs) in the car, truck, bus, and agricultural equipment segments. At the same time, the food processing industry strongly focuses on fruit and wine production.

The region is known for its high-quality grapes that are exported globally to produce popular wines. In addition, the Western Cape is a major producer of fruits such as apples, pears and citrus. These are processed into products from juices to preserves and dried fruits. The thriving fishing industry produces a variety of fish, shellfish, and crustacean products sold domestically and internationally.

Playing a key role in all these diverse segments in the Western Cape is FUCHS LUBRICANTS SOUTH AFRICA, which has a range of speciality, food grade and automotive lubricants at its disposal to service this plethora of industries. Branch Manager Bertie Brand started his career in the lubrication industry in 2007 in Paarl and joined FUCHS in 2014 when it acquired the company he was working for.

"We started as a small warehouse operation in Paarl," notes Bertie. From its initial 225 m^2 facility, it moved to a much larger 600 m^2 premises, to its current 1 000 m^2 footprint in Stikland Industrial in Cape Town, of which over 700 m^2 is warehouse space alone. "As we started to make inroads into the automotive and food and beverage sectors, taking on more and more OEMs, in November 2022, we decided to relocate closer to our key focus areas," explains Bertie. "Hopefully, we will double our current space in a few years."

This exponential growth path carried FUCHS through the Covid-19 pandemic and lockdown period when it was an essential food and beverage industry service provider. Although there was a dip in business then, the branch's upward trajectory continued, and it even signed new agricultural clients during this difficult time.

Bertie highlights that, apart from automotive, the biggest sectors are food processing and canning. "There are a lot of opportunities for us here as the market sector remains largely untapped," he notes. Smaller industrial segments are packaging and even a few pack houses. FUCHS is set to grow the retail side of its business, with a new sales representative appointed to oversee progress in the automotive and on and off-highway segments.

"There is a bit of everything in the Western Cape," says Bertie. "The one industry that is not strong, only because of the location, is mining. We supply small mines, but it is not big. There are also a few cement plants we are targeting as well." Looking to the future, there is a major uptick in demand for FUCHS' specialist lubricants for wind turbines and even solar power projects as the demand for renewable energy increases throughout the region.

Highlighting the ongoing success of FUCHS in the Western Cape, Bertie pays tribute to his closely knit team, who have garnered extensive experience in various sectors. "Many customers have stood by us through thick and thin, and this is due to the effort we put into maintaining these relationships and nurturing them into long-term partnerships."

Bertie concludes by saying that what keeps him passionate about the lubrication industry is that while it is fast-moving, FUCHS' product range is extensive enough to cater for all applications and sectors. "There is a constant drive to innovate and refine products to meet all the needs of our broad customer base. That is what makes it so interesting. You will never get bored with what you are doing." wn

Waterford Kamhlaba Uwcsa Targets Sustainable Off-Grid Energy Solution

Waterford Kamhlaba UWCSA, one of the first multi-racial schools in southern Africa, aims to go off the grid by 2030 as part of its strategic goals. As it celebrates 60 years of existence this year, the school is accelerating its sustainability efforts. The school's strategic intent is to be the leading African school in sustainability education, planning to go solar and be 100% off the grid by 2030. Other environmental projects include water purification and harvesting, greywater recycling, a bio-digester, and a permaculture garden.

Central to the school's deeper commitment to the environment and sustainability, it aims to have sustainable practices embedded in all aspects of the curriculum and the school's operation, ensuring minimal impact on the environment.

Commenting on the future, Jackie Otula, the school's principal, said: "We are committed and excited by the journey ahead driving our vision to be the leading school in sustainability education and practices, promoting sound environmental practices and doubling our efforts to achieve the global Sustainable Development Goals. We aim to be carbon neutral by 2030."

The school invites individuals and organizations to partner in the sustainability programme. Among other sustainability projects, the school is already actively engaged in the following:

WATER HARVESTING

Waterford Kamhlaba looks forward to being completely self-sustainable water-wise and having no carbon emissions. Its top dam was the first dam built at the school. As the school grew larger, the dam capacity was insufficient to supply the needs of the school, so a second dam was built to increase the water supply for the school. As well as the extra dam, sumps were built to capture the underground water pumped into the dams. It also harvests the rainwater from the larger roofs on campus, the classroom block, and the cafeteria. The harvested water is directed into the dams. The school's tank capacity, which gravity feeds the school with water, is 340 000 lt. It has nineteen 10 000 lt tanks and one 150 000 lt storage tank. The school uses approximately 120 000 litres of water a day.

BIO DIGESTER

The biodigester produces burnable biogas and a nutrient-rich slurry. The bio-digester resulted from a student-led project - funded by the students who won the Zayed Future Energy Prize in 2015. The function of this bio-digester is to use the left-over food from the school's cafeteria to fuel the heating of water used to wash dishes in the cafeteria kitchen. The food waste is fed into the bio-digester and is broken down into a burnable gas. This gas fuels the gas geyser, which heats the water used to wash dishes. A by-product of this process is liquid fertilizer used in our vegetable garden. The permaculture gardener uses any extra food waste from the cafeteria to make fertilizer, and the balance is given to staff members to feed their dogs and pigs. This bio-digester produces sustainable power, a reliable method of discarding our food waste, and an educational tool. wn

INDUSTRYAFFAIRS

Deep decarbonisation of cities essential for key climate targets

A new whitepaper from Danfoss lays out a new roadmap for decarbonising cities. Implementing existing technology for buildings, transport, and sector integration can bridge half the gap in the urban GHG emissions reductions needed for a 1.5°C pathway.

Cities account for 70% of global carbon emissions. Ultimately, the battle against climate change will be won – or lost – in cities.

Action is needed urgently to make the changes necessary to enable large-scale decarbonisation. To address this challenge directly, Danfoss is releasing a new whitepaper which sets out a clear, achievable pathway forward to enabling a green transition on a large scale. The paper shows how existing energy efficiency and electrification measures across sectors can immediately reduce emissions and accelerate a green transition in cities.

Commenting on the launch of the whitepaper, Kim Fausing, President and CEO, Danfoss, said: "We will not reach the goals of the Paris Agreement without deep decarbonisation of cities. The good news is that cities offer some of the best possibilities to optimise urban planning and accelerate a green transition. There are already accessible, cost-efficient technologies capable of cutting emissions sufficiently to meet global climate goals. These technologies are already used daily – for instance, in Sønderborg in Southern Denmark (Project Zero) - but they must be adopted more widely globally now."

As the world's population continues its surge towards 10 billion people by 2050[1], almost 70% of the world's inhabitants are now expected to be city dwellers by this date. In their current form, with energy demand continuing to grow, cities would produce a wholly unsustainable level of emissions that would be completely incompatible with key climate targets, such as the 1.5°C target set out by the 2015 Paris Agreement.

"Deep decarbonisation of cities is crucial for achieving key climate targets globally. As cities account for significant carbon emissions, our battle against climate change will be won or lost within these urban centres. Danfoss has ready solutions to facilitate large-scale decarbonisation in Africa, but urgent action is needed. To address this challenge head-on, Danfoss is proud to release a new whitepaper that presents a clear and achievable roadmap for enabling a green transition at a significant scale. This whitepaper highlights how existing energy efficiency and electrification technologies can immediately reduce emissions and accelerate the transition to a sustainable future across the continent," added Emil Berning, Country Manager - Danfoss Sub-Saharan Africa.

The whitepaper, 'Roadmap for decarbonising cities', draws upon various verified sources, including the latest data from the International Energy Agency (IEA), to demonstrate why action is needed. The whitepaper also shows how that action can be taken and highlights how the solutions that will enable this are already available.

KEY TAKEAWAYS:

- Energy efficiency in cities is essential for global decarbonisation. If all urban areas and cities in Europe, the US, and China invested in energy-efficient heating and cooling of buildings, this would contribute 20% to the 1.5°C target of the Paris Agreement.
- Electrification of vehicles will play a large role. Electrification of private (light) and public (heavy) urban transport is crucial for successful climate targets. 28% of the decarbonisation necessary to stay within the 1.5°C target of the Paris Agreement would be achieved if all urban areas in Europe, the US, and China electrified private and public transport.
- Improved efficiency can accelerate the electrification of transport. In passenger cars, heavy-duty vehicles, and marine transport, efficiency measures can reduce the size of the batteries needed, thus limiting the raw material requirements. Increasing efficiency can also bring down the demand for charging infrastructure and increase the productivity and range of the vehicle.
- Implementing existing technology for buildings, transport, and sector integration can bridge half the gap in the urban GHG emissions reductions needed for a 1.5°C pathway.

The whitepaper analysis provides a concrete roadmap for mayors, local decision-makers, and urban planners on how to eliminate all major drivers of the carbon footprint of cities.

The paper also explores how available technologies can improve the livelihoods of citizens while at the same time making our economies more resilient and creating jobs. wn

Paltech and Schneider Electric Global Announce Distribution Partnership

From left: 2Roads Group CEO - Dr André Botha; Paltech Pumps Operations Manager, Ryno Alberts; Schneider Electric Technical Sales Consultant -Process Automation, Maternique Dube; Schneider Electric Executive Sales - Process Automation, Hennie Coly; Paltech General Manager, Stephen Price; 2Roads Group Business Development Officer, Elmo Moore; 2Roads Group Head of Marketing, Nomonde Sihlahla.

Paltech, the leading South African original equipment manufacturer (OEM) for valves and pumps, is pleased to announce its strategic distribution partnership with Schneider Electric Global, a renowned French multinational company specializing in digital automation and energy management across various sectors.

Effective from 1st May 2023, Paltech has become the sole OEM official distributor of Schneider automation instrumentation in the entire Sub Saharan African region. Paltech's distinction as the only OEM among the four partners demonstrates its commitment to providing exceptional quality and service to its customers.

This ground-breaking partnership extends beyond our South African operations to include Paltech's sister companies, Paltech Ghana and Mwendo Engineering based in Mozambique.

Schneider's state-of-the-art automation instrumentation will enable Paltech to integrate automation capabilities into select valves, such as the highly acclaimed Pal-T.

By leveraging Schneider's innovative products and instrumentation, Paltech will further enhance its offerings, providing cutting-edge solutions to its clients in South Africa and beyond. As part of this distribution partnership, Paltech will stock and offer a range of select Schneider products and instrumentation, ensuring customers have access to a comprehensive portfolio of world-class solutions for their automation and energy management needs.

The official launch of the Paltech-Schneider distribution partnership took place this afternoon 25th May 2023, at 42 Steel Rd, Kepton Park.

This milestone event will bring together industry leaders, customers, and stakeholders to celebrate the union of two industry powerhouses and the vast potential it holds for the future. wn

DCC WINS MAJOR AWARD AT APC FOR SCHNEIDER ELECTRIC MEA AWARDS

Drive Control Corporation (DCC) has been awarded the prestigious Bronze Volume Distributor of the Year Award 2022 for the MEA region at the recent APC by Schneider Electric MEA President's Club Partner Awards held in Sharm el-Sheikh, Egypt.

The ICT distributor's APC by Schneider Electric sales continue to show tremendous growth and the award recognises DCC's strengthening role in not only South Africa but the MEA region. The award is indicative of the team's hard work and dedication in a very competitive marketplace. DCC has been an official APC distributor for almost 20 years and is responsible for the company's range of secure power technologies' single-phase UPSs and edge computing infrastructure such as racks, PDUs (power distribution units) and NetBotz access control sensors. wn

Steady Energy raises 2 million euros to decarbonise residential heating with small modular nuclear reactors

The VTT spin-out will build a heating plant powered by a small nuclear reactor, designed to produce heat efficiently, safely and carbon-neutrally, at considerably lower temperature and pressure than traditional nuclear reactors.

Steady Energy, a spin-out company from VTT Technical Research Centre of Finland, that aims to decarbonise the energy-intensive heating industry starting with residential and district heating, has raised EUR 2 million in seed funding led by VTT, Yes VC and Lifeline Ventures. Steady Energy aims to build the world's first LDR-50 reactor-based heating plant by 2030. The company will use the raised funding for research and development work to demonstrate the functionality of the plant by building a 1:1 scale mockup powered by electric heat.

The LDR-50 district heating reactor is a small modular nuclear reactor which has been in development at VTT since 2020. LDR-50 is a type name for a reactor with a heat output of 50MW. Designed to operate at around 150 degrees Celsius and below 10 bar (145 psi), its operating conditions are less demanding compared to those of traditional reactors, simplifying the technical solutions needed to meet the high safety standards of the nuclear industry.

"The pressure required by the LDR-50 reactor is comparable to the pressure of a household espresso machine. It operates at a lower pressure than a district heating network. This ensures that in case of a malfunction which leads to a leak, the leak is contained within the heating plant, without endangering people or the environment," says Tommi Nyman, CEO of Steady Energy.

About 50% of all energy consumed by EU households goes toward heating homes. European annual district heat consumption is approximately 500 TWh, out of which about 300 TWh is produced by fossil fuels. Decarbonising residential heating in Europe alone is a market with significant growth potential in the hundreds of billions of euros. Throughout Europe, there are approximately 3,500 district heating networks which serve 60 million people, largely powered by fossil fuels. Successful, large-scale decarbonisation of district heating can significantly cut greenhouse gas emissions.

"75% of district heating systems in the EU are currently powered by fossil fuel. The situation is even worse in China. Nuclear energy is already a major source of low-carbon electricity, and small modular reactors represent a pathway to expand the use of the technology to other energy sectors in addition to heating. On top of being safer than traditional reactors, SMRs are more affordable. We're setting up a demonstration plant for district heating purposes ideally in Finland, but our long-term plan is to have several plants operating around the world, producing carbon-neutral heat to homes, offices and for various industrial applications. We will bring to market the world's best nuclear energy technology optimized for the heating sector," continues Nyman.

The passive heat removal solution incorporated into the LDR-50 reactor has a major role in its safety. Passive systems make it possible to meet extremely high safety requirements with simplified technology.

The LDR-50 reactor module is made of two nested pressure vessels, with their intermediate space partially filled with water. When heat removal through the primary heat exchangers is compromised, water in the intermediate space begins to boil, forming an efficient passive heat transfer route into the reactor pool. The system does not rely

From left: Tommi Nyman (CEO, Steady Energy) and Hannes Haapalahti (CTO, Steady Energy).

on electricity or any mechanical moving parts, which could fail and prevent the cooling function. The innovation was awarded a patent in 2021.

"Nuclear power know-how, national energy policy and the world's leading district heating network provide the world's best starting point for Steady Energy to start its business specifically in Finland," says Timo Ahopelto, Founding Partner at Lifeline Ventures.

"Europe and the United States have woken up to the fact that small reactors will become part of energy production already during this decade. We are talking about a very significant market globally", says Jyri Engeström, Founder and Partner at Yes VC.

"At VTT, we've been turning hope into action for 80 years by driving scientific innovation to change the world and businesses for the better. Right now, humanity is facing its most challenging adversary, climate change. We are on a journey to explore tomorrow's technologies and innovate cutting-edge solutions to build the carbon-neutral societies of the future. Steady Energy represents our commitment to our purpose and embodies the hope we want to bring to the world," says Jussi Manninen, Executive Vice President of VTT.

Steady Energy will plan its business models according to the needs of the customer and is ready to deliver heating plants directly to customers. The unit size of LDR-50 is 50 megawatts, which is sufficient for heating a small city. A single heating plant can have multiple reactors. The heating plant could even be used as a desalination plant to produce fresh water in areas of the world suffering from water shortage, or it can be modified to produce steam for industrial purposes.

"To preserve our planet and ensure generations to come have a healthy planet, all combustion-based heating must come to an end. Alongside renewable energy, nuclear energy provides a steady source of energy and heat that meets the needs of modern society and helps us in our fight against climate change," concludes Nyman.

The project has been part of VTT LaunchPad, a science-based spin-off incubator, where VTT researchers and technology are brought together with the best business minds and investors out there to renew industries. VTT LaunchPad supports incubator teams to develop VTT-owned IPR into fundable spin-off companies. wn

How to choose a storage battery

South Africans are no longer discussing whether they should have a backup solution to deal with Eskom's inability to provide enough electricity to power the country. Instead, those with the means have invested in a backup solution or actively seek the best solution.

By: Lance Dickerson
Managing Director, REVOV

The green tide cannot be stopped. In other words, we know that generators are an option, but more and more people appreciate that we only have one planet. We are precariously close to a doomsday scenario where the dominoes begin to fall. On the other hand, even if the idea of going green in the best interest of the planet doesn't move someone, the reality is that international trade is increasingly dictating an investment in renewables. South Africa has an obligation, and failing to come to the party may well come with undesirable trade consequences.

Whether a household or a business invests in renewable energy generation, such as solar, or an uninterrupted power supply (UPS) system, batteries are an integral component. If the wind is not blowing and the sun is not shining, the electricity that has already been generated needs to have been stored to carry the system until the renewable source resumes once more.

And this brings us to the discussion about batteries. Choosing the right battery is like peeling an onion. Each layer needs to be carefully considered.

FIRST LAYER – THE CHEMISTRY

This is perhaps one of the most crucial elements. If the chemistry inside the battery is not right, it will be ineffective and dangerous. Different chemistries are better suited for specific environments. For instance, automotive-grade battery cells deliver extreme temperature resilience and high energy density, which makes them well-suited to environments that rely on these characteristics.

SECOND LAYER – CHARGING CAPACITY

Once you are satisfied with the chemistry, you must ensure that the chosen battery has the right capacity insurance. This provides the ability to support the charging required and remain within the paradigm critical for the system chosen.

THIRD LAYER – WELL-DESIGNED BOX

The battery cells must be of the highest grade. The chemistry means little if the battery is not constructed correctly. The physical box must be rugged, while the connections to the cells for monitoring and power delivery must be solid. The battery must have a well-designed box that can take shocks.

FOURTH LAYER – SAFETY

The battery should not leak or explode. The safety specification of the battery you choose is an important consideration. Chemical devices must be designed and stored correctly, as this speaks directly to their safety.

A lithium battery, for instance, features a battery management system (BMS) that monitors and shuts down the battery if something goes wrong. There are also physical signs to check out, such as whether the battery is malformed or has watermarks.

2nd LiFe batteries from electric vehicles (EVs) are tailor-made to deliver the performance and safety required to be quality, robust storage batteries. Suppose you consider that 2nd LiFe batteries have 10 to 15 years of use once we have repurposed them from their first LiFe in EVs into storage batteries. In that case, the value is two-fold: first,

you pay less for high-grade batteries, and second, by repurposing EV batteries that would have ended up in landfills by their tons, we can move off the grid in a carbon-sensitive and sustainable manner. This brings us to the final layer.

FIFTH LAYER - CARBON FOOTPRINT

As mentioned, there is no turning back. Carbon footprint matters for two reasons. First and most importantly, choosing the lowest carbon footprint is the right thing to do. Our children and their children deserve a healthy planet. Secondly, companies and countries will increasingly be measured by their carbon footprint as the world shifts towards renewables and trade is at stake.

There is no battery with a lower carbon footprint than a 2nd LiFe battery. One of the biggest ironies of the shift towards renewables is that first-life lithium batteries (and the inferior lead acid or gel batteries, for that matter) come with a high carbon cost. The raw materials must be mined, shipped across the planet, beneficiated, and shipped to their target markets. This is no small footprint. 2nd LiFe batteries, on the other hand, are the single-most carbon-friendly option because they have already lived their first life in the EV market. The components are made of the best cells, a casing and the BMS - no new lithium (or lead) is mined and beneficiated, and the cells are put to good use instead of being tossed into landfills. Choosing the 2nd LiFe, which has comparable performance and lifespan, is right for our planet. wn

Unleashing the Power of E-Learning

WHY IT'S THE ULTIMATE CHOICE FOR MODERN EDUCATION

E-learning has become imperative in today's fast-paced and digitally-driven world. With the advancements in technology and the widespread availability of the internet, e-learning offers six benefits that make it an essential tool for education and skill development.

By Lance Levin, CTI Services

Here are some of the key advantages of using e-learning:

ACCESSIBILITY: E-learning breaks down geographical barriers and allows learners to access educational resources anywhere. It supplies an opportunity for individuals who may not have access to traditional education to buy knowledge and skills.

FLEXIBILITY AND CONVENIENCE: E-learning allows learners to study conveniently and conveniently. They can access learning materials and courses anytime, allowing them to balance their education with other commitments such as work or family commitments.

PERSONALISATION: E-learning platforms often use adaptive learning techniques, which tailor the content and pace of learning to individual learners' needs. This personalised approach ensures learners receive a customised learning experience, maximising their understanding and retention of the material.

COST-EFFECTIVENESS: E-learning cuts the need for physical classrooms, textbooks, and commuting expenses, resulting in significant cost savings for learners and educational institutions. It makes education more affordable and accessible to a larger population.

INTERACTIVE AND ENGAGING: E-learning incorporates multimedia elements such as videos, animations, quizzes, and interactive exercises, making the learning experience more engaging and effective. This interactivity stimulates learners' interest and promotes active participation, leading to better knowledge retention.

CONTINUOUS LEARNING: E-learning allows for continuous learning and upskilling. Learners can access various courses and resources on various subjects, enabling them to stay updated with the latest developments in their field and get new skills throughout their lives.

In conclusion, e-learning is imperative due to its accessibility, flexibility, personalisation, cost-effectiveness, interactivity, and continuous learning opportunities. As technology advances, embracing e-learning is essential to meet the evolving educational needs of individuals and organisations in the digital age.

Click here for more information on the SAIEE Training Academy E-learning platform. wn

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Managing data when work happens anywhere

Work no longer has to happen at the office. People can be productive even if they are far away from their desks.

The ability to work remotely is overtaking traditional perks such as a nice canteen or casual Fridays. A 2022 Gallup survey supports this change, revealing that the majority of 13,085 U.S. employees listed pay, benefits, work-life balance and doing what they do best as their top priorities.

"The business world was a bit sceptical and suspicious of working remotely," says Wade Calenborne - Chief Operations Officer at Sithabile Technology Services. "But those attitudes have changed in a big way. We once treated it as a perk to award to your best employees. We know creating happy employees and cohesive teams is a better way. Even a simple thing, like not having to attend every meeting physically, has been a huge benefit and one that people will fight to keep."

REMOTE WORK'S DATA RISK

Those Gallup findings often rely on the ability to work from different places—not just remotely but even inside a company campus—and access company resources from anywhere. Yet providing that convenience can create big problems.

"The obvious problem with remote working is that you can lose control from a risk and security standpoint. People copy and share files, remote devices are more susceptible to attacks or getting lost, and you weaken your data environment overall. That also impacts your ability to digitally evolve and adopt competitive services such as analytics and artificial intelligence, not to mention effective governance, policy and audits."

Beyond those concerns, poor data management harms collaborative work. Finding proper file versions or organising team groups with shared access becomes harder if you don't have a handle on your data. And if your data management is too draconian, it inhibits access and encourages people to find workarounds that lead to new risks and inefficiencies.

MANAGE DATA IN THE REMOTE ERA: Balancing data management and remote working is one of the main challenges for affiliated organisations. There are several things they can do:

CREATE A DATA STRATEGY: Data management is complex, so it must be guided by a strategy that covers business and technical needs. The data types and their uses, governance, compliance, and security needs all fall under the strategy.

AUDIT THE DATA: Know what data the business has categorised by purpose, owners, risk level, and access priority.

AUDIT THE INFRASTRUCTURE: Data storage is essential yet often a cost centre, so know what storage is available and whether it's sufficient for the data strategy and types. A crucial distinction is between hot, cold and archived data and hosting such as company-owned servers or cloud storage.

PROFILE USERS: Identify different user groups based on their data access needs, roles, and access requirements. For example, a financial executive who travels frequently may need access to sensitive data via their phone and the internet, which could pose serious risks but substantial business benefits.

SELECT APPROPRIATE TOOLS: Data management and sharing is a wide field, so select the right tools once all the needs and user groups are clear. Data software ranges from file sharing and collaboration suites to content

management platforms to data loss prevention solutions. They can be on-premise, based in the cloud, or be a hybrid of both. Such tools can also inform choices for other software, such as identity and device management.

BRING IT TOGETHER: With a grasp on strategy, data and user profiles, and suitable software, companies can integrate everything into a single environment, reducing risk by managing user access and file-sharing policies, and providing specific tools to specific employees such as team leaders.

Following this process can be daunting, and Calenborne advises enlisting the support of a partner that specialises in data environments: "Companies make a mistake by getting the technology first and forcing everything else to fall in line. They can easily lose sight because of how much data they have and the pressure to make that data useful. An experienced data management partner will help identify the best choices because we have a lot of experience working with different clients and vendors. We know what's possible, listen to what you need, and bring the two worlds together. It's different for each business, but many overlaps will save time and effort."

Remote working can be fantastic for productivity and employee morale. It also puts data management and access under the spotlight. Since no modern company can move forward without proactive and productive control over its data, remote working is an opportunity to modernise.

Help your people and data work from anywhere, and you pave the way to more productive employees, better business intelligence, and a truly 21st-century organisation. wn

Cybersecurity for SMEs

SAFEGUARDING GROWTH AND TRUST

In today's interconnected world, small and medium-sized enterprises (SMEs) globally, including those in Africa, face growing cyber threats that can disrupt operations, compromise sensitive data and harm their reputation. As technology advances, malicious actors continuously adapt their tactics to exploit vulnerabilities. SMEs in Africa play a vital role in the economy, contributing to job creation, innovation and overall economic growth.

However, they also encounter numerous challenges that hinder their progress and long-term viability. African SMEs must recognize the significance of prioritizing cybersecurity to protect their valuable assets and maintain trust with customers and partners. By prioritizing cybersecurity, SMEs in Africa can safeguard their operations and contribute to job creation and employment opportunities for a significant portion of the population.

Furthermore, these SMEs can foster an environment conducive to invention, innovation and the developing of new ideas and technologies.

To navigate the complex cybersecurity landscape, here are five must-have suggestions every SME should consider:

ENDPOINT SECURITY: The endpoint, encompassing devices such as laptops, smartphones and other employee-used tools, often represents a critical vulnerability within many businesses. To safeguard valuable data, Endpoint Detection and Response (EDR) technology is specifically engineered to fortify these access points against potential cyber threats. An SME's EDR solution encompasses various tools, including advanced detection engines, real-time analytics and the capability to proactively hunt, investigate and centrally respond to evasive threats across the protected infrastructure. It is imperative to apply threat intelligence and attain comprehensive visibility into endpoints to ensure robust protection.

VPN (VIRTUAL PRIVATE NETWORK): A VPN offers a secure connection over the Internet, safeguarding data from cybercriminals and hackers. A VPN is essential for SMEs with remote workers to maintain secure connections. Public Internet connections in coffee shops, airports and guest houses can be vulnerable to hackers, but a VPN creates a protective barrier, preventing unauthorized access and ensuring data privacy.

CYBERSECURITY AWARENESS TRAINING: Educating employees about cybersecurity is often SMEs' first line of defence. Continuous cybersecurity awareness training can significantly reduce the risk of successful cyberattacks. SMEs can enhance their security by teaching employees to identify phishing scams, use strong passwords, and follow safe online practices. Solutions like the Kaspersky Automated Security Awareness Platform offer interactive training sessions that instil the importance of cybersecurity while providing practical advice and recommendations.

BACKUPS: Regularly backing up data is crucial for SMEs to recover quickly and minimize disruptions in a cyberattack. Backups should be performed frequently and stored off-site or in the cloud for maximum protection. By implementing

robust backup procedures, SMEs can ensure the availability and integrity of their critical business data.

CLOUD SECURITY: As SMEs increasingly adopt cloud services, securing these environments becomes paramount. Choosing a trusted cloud service provider and implementing cloud-specific security measures to protect sensitive data is essential. While the cloud offers numerous benefits, SMEs must take responsibility for securing their data during migration and while it resides in the cloud. SMEs can mitigate risks and safeguard their digital assets by understanding and deploying the necessary steps to maintain cloud security.

With cyber threats evolving rapidly, SMEs must recognize the importance of cybersecurity as a necessity in the digital age. By implementing the five tips suggested above, SMEs can enhance their security posture and protect themselves and their customers from potential cyber threats. Investing in cybersecurity measures safeguards a company's reputation and builds customer trust. On this "Micro-, Small- and Medium-sized Enterprises Day," Kaspersky encourages all SMEs to reevaluate their cybersecurity measures and contribute to a secure and resilient digital Africa. wn

How ChatGPT will drive Chatbots in 2023

By | Frederick Savage

Chatbots are AI computer programme that uses techniques designed to simulate conversational interactions with human users, which may also include automated processes triggered by these interactions.

Chatbots are integrated within messaging applications, mobile applications, websites and other digital services that use digital assistants to communicate. There are four key types of chatbots, including:

- Messaging Application Chatbots
- App-based Chatbots
- Web-based Chatbots
- RCS Chatbots

Chatbots can also be hosted on APIs (Application Programme Interfaces) in a variety of digital communication channels, such as OTT (Over-the-Top) messaging apps and RCS (Rich Communications Services) platforms.

There are two main types of chatbots for commercial and industrial use:

TRANSACTIONAL CHATBOTS

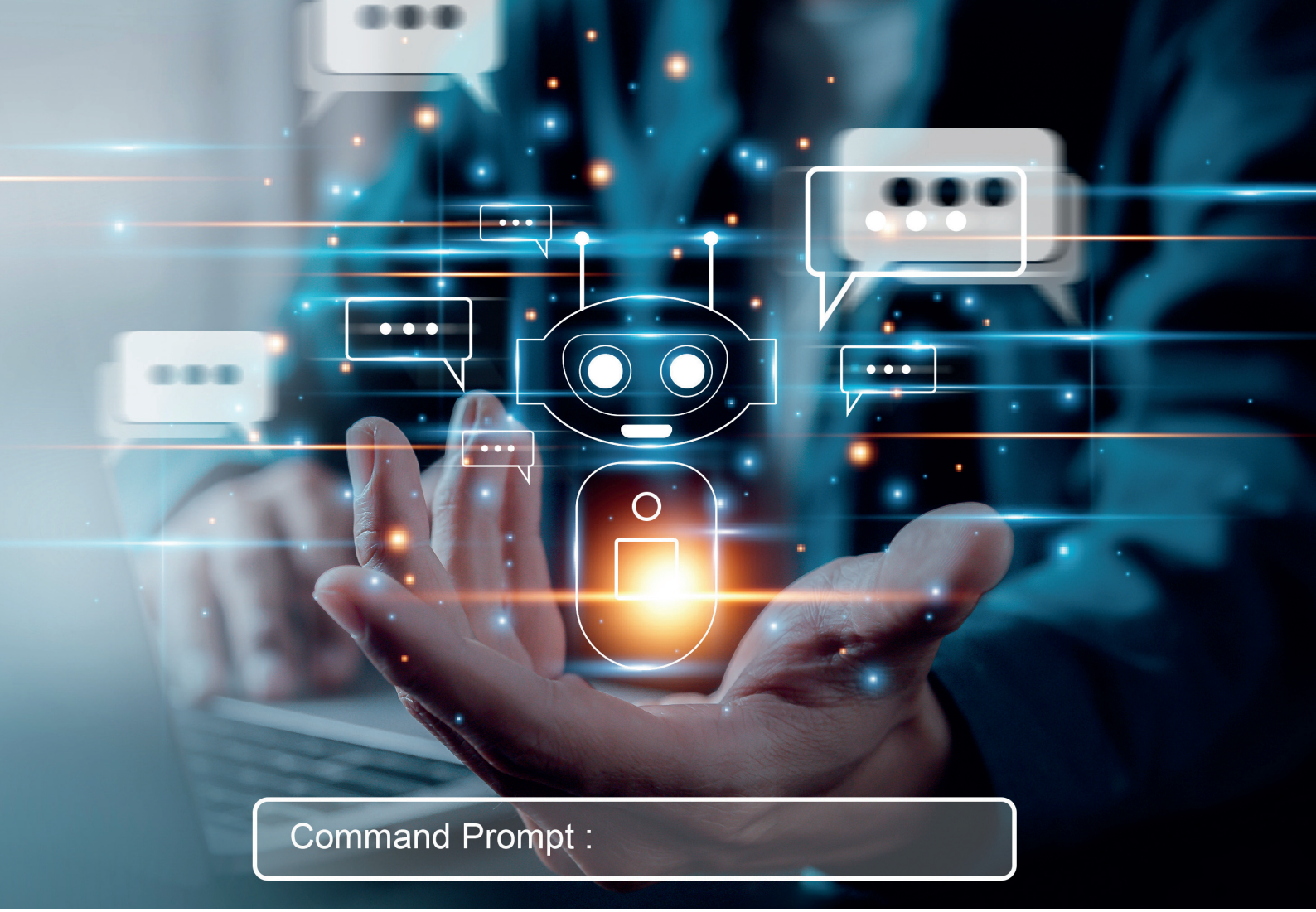
These are meant for simpler interactions in which there are more limited and discrete communication pathways for customers to go down in trying to solve a query. These predetermined pathways will be based on what the service provider perceives and programmes as common customer queries.

CONVERSATIONAL CHATBOTS

These chatbots are meant to be more complex, less discretely predetermined, and provide more human-like conversational interaction with customers and their queries. This will require more sophisticated technology to automatically tailor communication pathways to each interaction, using AI, machine learning and linguistic software such as NLP and NLU.

CHATGPT IS SIGNIFICANTLY LOWERING THE BARRIERS TO ENTRY FOR CHATBOT ADOPTION AMONGST ENTERPRISES

Since late 2022, conversational AI has gained substantial popularity, with the November 2022 launch of OpenAI's ChatGPT (Generative Pre-trained Transformer). ChatGPT is a chatbot with a generative large language model. The initial language model on release was GPT-3.5, but the subsequent GPT-4 was released in March 2023. It has been regarded as the most astonishingly advanced demonstration of AI's real



concrete offerings and capabilities and was described by the New York Times as 'the best artificial intelligence chatbot ever released to the general public. However, along with praise, ChatGPT was met with amplified criticisms and concerns over AI's threats, such as the greater obsolescence of human labour and the national security concerns that may stem from it.

While it seems that most of the curiosity over ChatGPT lay in the whims of popular culture and media attention, it has had immediate implications on and adoption across various industries, particularly in the market for chatbot solutions. Some vendors mentioned below have already adopted language models directly from OpenAI or were at least spurred on and inspired by them; this includes Aivo, Teneo, Chatfuel, Conversica and Kasisto.

It has been less than a year since ChatGPT has taken off in so many areas of public life, and much is yet to come in the future.

CHATBOT ECOSYSTEM

The chatbot ecosystem is relatively robust, and Figure 1 highlights the current chatbot ecosystem and shows what role key market stakeholders are adopting in the development of chatbots as an ecosystem. Moreover, this ecosystem highlights many types of chatbot technology, including enabling and third-party technology.

END-TO-END SOLUTION PROVIDERS

Whilst smaller enterprises use chatbots to undertake simple common tasks and customer queries, these end-to-end solution providers are usually fitting for larger market players, who require more complex chatbot solutions.

These providers work with large companies to understand their specified demands and customer needs and hence develop chatbots with more tailored processes. There are also the kinds of more sophisticated chatbots which can carry out machine learning, NLP and deep learning for the chatbots to adapt themselves to changing trends in customer and market demands, which is particularly important for such an ever-changing technology.

SELF-SERVICE CHATBOT SOLUTIONS

Smaller companies with more modest budgets and simpler customer demands and queries will find usage for chatbot solutions, but those with more basic tasks and processes. These are usually the sorts of chatbots that facilitate full customer self-service since these more basic tasks are more capable of being fully automated. Whilst these chatbots

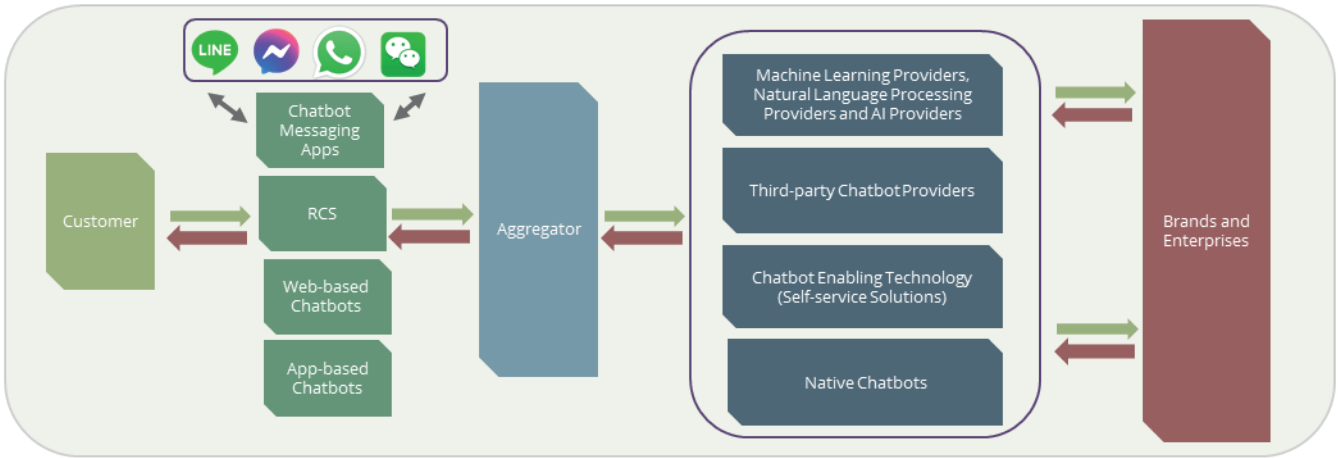


Figure 1: Chatbots Market Ecosystem

are less costly than more tailored ones designed for complex processes, it raises concerns with smaller vendors about whether their chatbots are developed in-house or whether they need to hire staff, especially for it.

CHATBOTS CHANNEL ANALYSIS

This section discusses the potential avenues to support chatbots' future progress.

MOBILE SUBSCRIBERS

The total number of global mobile SIMs will increase from over 9 billion in 2023 to over 10 billion by 2028. This high consistency in SIM growth is due to the increase in mass availability and decreasing costs of communication technology, which is helpful for general personal communication services and enhances resource and time efficiency in business operations. SIMs have surpassed the global population, showing how penetrative mobile phones are in the present age, as it is predicted that many of the population have more than one active SIM in use at one time.

However, this has come with increased intensity in markets for digitalised services which can create pressure and dilemma to manage the full magnitude.

NATURAL LANGUAGE PROCESSING

In today's chatbot ecosystem, most chatbots are integrated with NLP technology, which allows the chatbot to determine the meaning from language. This is where natural language is broken down and converted into data elements, enabling the computer to decipher its meaning.

NLP is a subfield of linguistics and AI, and it aims to supply machines with the ability to understand and respond to both tech and voice data. This NLP not only allows the chatbot to understand this language but also allows the chatbot to reply in the same medium, similar to how humans converse. NLP combines statistics with computational linguistics, machine learning and deep learning models. This allows the chatbot machines to process human language in the form of both text and speech and be able to understand its full meaning.

NATURAL LANGUAGE UNDERSTANDING: NLU, a further subset of NLP, aims to extend its machine linguistic capabilities. It uses different algorithms to interpret the natural language, derives meaning, identifies context, and draw insights from text or speech data. It can also understand how the same words may have different contextual meanings and overcome language flaws, such as spelling mistakes, thus removing the ambiguity recognised by NLP.

CONVERSATIONAL AI MATURITY:

Conversational AI combines NLP and NLU with traditional conversing software such as chatbots, voice assistants and interactive voice recognition systems, and this is communicated through a spoken or written interface. Juniper Research has identified four models for conversational AI. These include:

Scripted Chatbots - Scripted chatbots are rule-based chatbots that use decision trees to utilise a set of manually pre-defined rules to respond to customer questions. However, these chatbots only have a limited number of responses. These chatbots are built to respond to specific questions, such as a brand or enterprise's FAQ (Frequently Asked Questions) section. In these scripted chatbots, each command is written independently. If the user's query does not align with these pre-defined sets of commands or does not have relevant keywords, then the chatbot will respond with an error message. Although these chatbots are beneficial, as they are quick to develop and can answer many simple

customer queries, they are limited in their application. The fact that users have to enter specific keywords to get an answer from this chatbot can lead to user frustration, which can lead to the user no longer engaging with that brand or enterprise.

NLP Chatbots - NLP chatbots can respond to customer queries with a larger array of suggestions due to the inclusion of machine learning capabilities. Using syntax analysis, NLP chatbots can deconstruct the user's input and analyse its meaning to provide the most appropriate response or action.

Contextual Chatbots: These chatbots are the most advanced type of language processing. Contextual chatbots use AI and machine learning to remember past conversations and can learn patterns of behaviour to adapt over time. These contextual chatbots use NLU to understand language semantics to decipher sentiment and intent. Moreover, these chatbots are capable of contextualising within the conversation and are therefore able to circumnavigate mistakes in spelling and grammar to keep the conversation flowing.

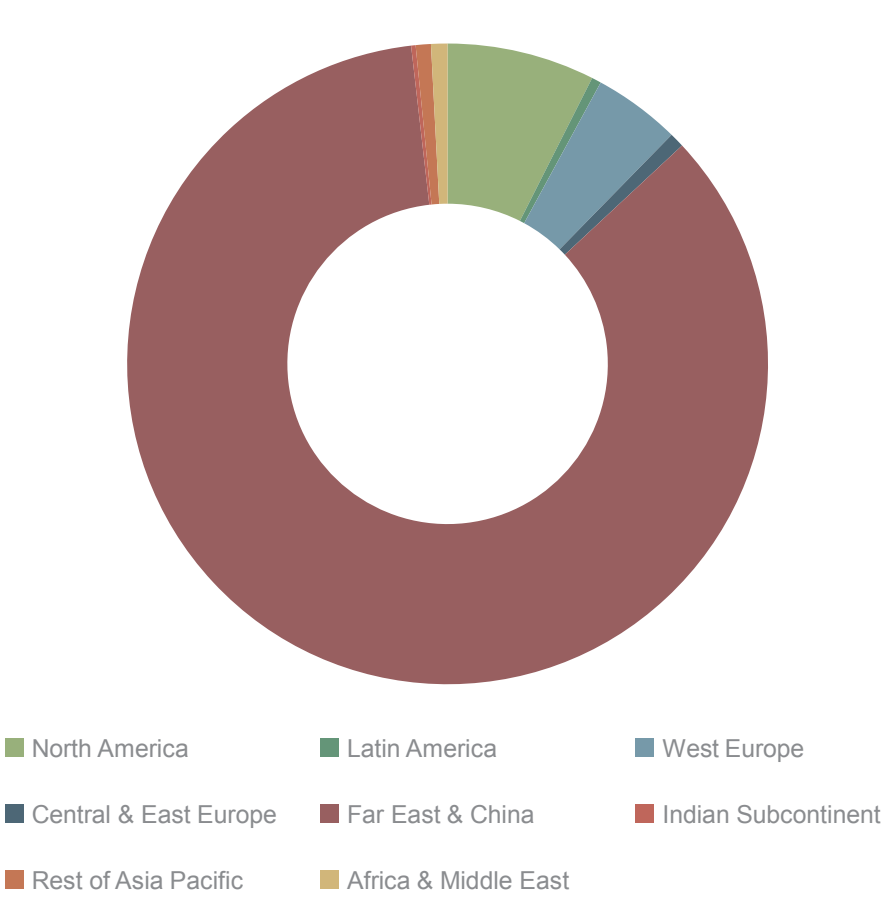


Figure 2: Total Chatbot Retail Spend in 2023, Split by 8 Key Regions: $12.6 Billion

MARKET FORECAST SUMMARY

GLOBAL RETAIL SPEND OVER CHATBOTS

Global retail spending over chatbots is forecast to reach $12 billion in 2023, growing to $72 billion by 2028. Increasing by 470% over five years, much of this growth will be driven by the emergence of cost-effective available language models, most notably ChatGPT, in regions such as North America and Europe.

Open language models consist of large neural networks trained on substantial quantities of online information and learn through low levels of human supervision. They are implemented into chatbots to automate customer support, marketing and payment processing functions.

The development of open language models will become a key driver for retail spending growth amongst small and medium retailers that were previously unable to invest in chatbots. Chatbots have historically been a low priority for omnichannel strategies owing to the high cost of training AI-based algorithms. However, ChatGPT has significantly disrupted this trend, lowering the cost of implementing chatbots for smaller retailers.

Additionally, Asia Pacific will account for 85% of global retail spending over chatbots, despite only representing 53% of the global population. Messaging apps, including WeChat, LINE and Kakao, have built strong partnerships with various online retailers, resulting in high confidence in chatbots as a retail channel.

However, releasing open language models will drive growth outside Asia Pacific. By 2028, 66% of spend is forecast to be attributable to the region, as online retailers in other areas, such as North America and Europe, implement chatbots into retail activities. Chatbot vendors must target online retailers in these two regions to maximise this growth outside of Asia Pacific.

Combatting Online Payment Fraud

By Cara Malone

Online payments are a large target for fraudsters. This is because there are millions of loopholes to exploit, such as card details being stored digitally for eCommerce. Since the pandemic, the eCommerce market has grown exponentially. Indeed, it is expected to rise to $7.95 trillion by 2027, according to Juniper Research's eCommerce Payments report. This gives fraudsters more opportunities to conduct online payment fraud and take advantage of any part of the process with various fraud types.

Online payments are a prime target for fraudsters, as they do not need a physical card where cards are involved. There are typically two types of card payments: card present, where the physical card is used to buy something, and card not present, where the card details are used, but the physical card itself is not required. The card not present is the type of payment used for eCommerce, as only the card details are required, and these can be stored digitally.

However, it is also easier for fraudsters to get away with this, as it is harder for the seller to verify who makes the purchase. Alternative payment types, such as digital wallets and BNPL, can be subject to ATO (Account Takeover) attempts.

The dark web, a corner of the Internet where criminals can interact without being traced, is often where fraudsters buy and sell the card and account details and share information on committing fraud. Some of this information can include what tools to use to commit fraud and the best ways of going undetected.

Many anti-fraud measures have evolved. However, there are constant developments within fraud rendering these methods void. Challenges must be tackled in online payments, as new types of fraud, such as 'silent fraud', combined with cybersecurity vulnerabilities, contribute to a mix of attack vectors.

As can be seen throughout most industries, disruption has the potential to be used for good, as it opens opportunities through innovation. However, online payments are not isolated but operate in a complex web of interactions. The use of open APIs, whilst creating ample opportunities for stakeholders, must be considered in line with potential fraud. The identity network, a key component of payments, is a driving force that can build trust and create opportunities for fraud.

Cybercriminals always tend to be one step ahead. They use a mix of social engineering and technology know-how to circumvent systems. The ultimate aim for fraudsters is financial,

so targeting payment systems is ideal. Understanding the threat landscape is crucial to reinforcing protection while keeping innovation clear of unwanted exploitation.

KEY TRENDS IN DIGITAL FRAUD

CHANGING FRAUD LANDSCAPE AMIDST UNPRECEDENTED CIRCUMSTANCES

Fraudsters continue to adapt to global situations, such as COVID-19 and the war between Russia and Ukraine. For example, they leverage the war to steal money from well-meaning UK residents.

The scams involved are donation scams, where fraudsters use email and text messages, including a link to a false charity website. Another way the fraudsters are trying to make money involves an individual, supposedly a Ukrainian businessman, trying to move money out of the country, needing a bank account outside Ukraine. In reality, a fraudster attempts to steal that person's bank details and empty their account.

Another example of a war-related cryptocurrency scam that originated early on in the war was when fraudsters carried out a crypto fundraising effort through Peaceful World. This Uniswap currency exchange jumped dramatically and netted over $50 million before being identified as a scam. Cryptocurrency transactions are final and anonymous, making them particularly attractive to scammers.

Flashpoint analysts have uncovered 262 cryptocurrency addresses used in advertisements for donations to Ukrainian or Russian causes related to the war since February 2022. As the Russian invasion of Ukraine draws a growing need for financial contributions to fund military and humanitarian relief, cryptocurrency has become a way for governments to directly source funds and bypass traditional aid processes that delay or restrict the aid received.

Although there have been official calls from the Ukrainian government to make cryptocurrency donations through associated accounts, it has been observed that various people are attempting to attract funds to support specific military units in the war and taking advantage of the crisis to scam victims into paying them instead. This will likely continue as scam opportunities increase after this war, with more donors willing to contribute using cryptocurrency.

The more advanced scammers are also digitally altering photos and using deep fake video technology to appear to show evidence that loved ones or close friends in Ukraine urgently need money sent to them. There is often also a short time limit at work in the request, with victims pleading with would-be donors to send funds as soon as possible.

Quarterly fraud analysis from global information and insights provider TransUnion found that the rate of suspected digital fraud attempts from the UK increased by 32% when comparing Q2 2021 and Q2 2022, with financial services and insurance have seen the biggest increases.

In financial services, the rate of suspected digital fraud attempts has more than doubled this period as fraudsters capitalise on the digital acceleration seen during the pandemic.

The insurance sector is close behind with the most common digital fraud type reported to TransUnion by companies in this sector, first-party application fraud, where policyholders provide inaccurate information to get lower rates or better terms.

ECONOMIC UNCERTAINTY

Economic uncertainty in several countries also impacts companies, especially SMEs, and the funds they have to put towards FDP solutions. Companies need to invest in high-quality fraud detection and prevention systems. However, with growing costs, this may seem like less of a priority to certain businesses.

IDENTITY THEFT A MAJOR CHALLENGE

Identity theft is collecting personal information from individuals and using it to commit criminal acts by simulating their identity. This fraud is rampant, resulting in millions of dollars of damage yearly in the US. The face of identity theft has changed. Unfortunately, consumers are unaware of this change, primarily due to the advertising of credit bureaus, some ID theft service companies and lack of news. ID thieves are the one group that understands the changing faces of identity theft.

Online verification of identity during a transaction comes in several forms. Verification can be a persistent assurance level offered by various government ID schemes, or an on-the-fly check, using ID networks and data orchestration-based services. eWallet system types may also provide verified claims that could be used to identify a user definitively. The Open Banking initiative also has massive potential to be used to assure a user (as well as manage the payment) during an online transaction. More sensitive or important resources, such as online banking and other financial accounts, require high levels of user identity and anti-fraud checks. Proof of identification and often intensive online KYC processes are becoming fundamental in the payment industry.

The other end of the identity spectrum is the focus of cybercrime on manipulating human behaviour via techniques like spear-phishing. Social engineering is highly effective, and during the COVID-19 pandemic, phishing spikes were observed by many security vendors.

As APIs increasingly become part of the identity ecosystem and, by association, the payments ecosystem, securing the API system must become a central aspect of a 360-degree angle on generating a certain payments ecosystem posture.

ACCOUNT TAKEOVER INCREASED

ATO (Account Takeover) fraud happens when a cybercriminal gains access to the victim's login credentials to steal funds or information. Fraudsters digitally break into a financial bank account to take control of it and have a variety of techniques at their disposal to achieve this, such as phishing, malware, and man-in-the-middle attacks, among others. ATO is a top threat to financial institutions and their customers due to the financial losses and mitigation efforts involved.

Fraudsters can take over existing accounts, such as banks, credit cards and eCommerce. Some account takeovers begin with fraudsters harvesting personal information from data breaches or purchasing it on the Dark Web. Personal information such as email addresses, passwords, credit card numbers and social security numbers harvested are valuable to cyber thieves for financial gain. When an account takeover attack is successful, it can lead to fraudulent transactions, credit card fraud and unauthorised shopping from compromised customer accounts.

Account takeover is often referred to as a form of identity theft or identity fraud. Still, it is mainly credential theft because it involves stealing login information, allowing the criminal to steal for financial gain. Account takeover fraud is continually evolving and is a constant threat in different forms. A successful account takeover attack leads to fraudulent transactions and unauthorised shopping from the victim's compromised financial accounts.

ATO (Account Takeover) is a significant loss area in most global markets, supported by the previously highlighted tailwinds of data breaches and FIs offering increased access and services. These tailwinds are likely to continue, and it is, therefore, likely that the proliferation of ATO will increase in the next few years. In response to this persistent threat, FIs will need to adopt a mindset, when designing their fraud defences, that it is not a matter of 'if' but rather 'when' fraudsters will have access to their customer's personal information and account access detail.

With this mindset, FIs must focus on a multi-layered approach to mitigate ATO losses, including increased adoption and sophistication of authentication, such as multi-factor access authentication.

Awareness of authentication is at a record high as it becomes ubiquitous in our daily usage of mobile technology, and this will assist FIs in the full roll-out of sophisticated, next-generation profiling

capability of customers and behaviours, utilising the latest AI profiling capability with additional data sources for context. Individually, authentication and profiling can be exploited by fraudsters. When combined with additional layers, they are an effective deterrent.

Many already refer to ATO's perceived industrialisation in the past 12-18 months. In this event, we will likely experience Account Takeover 2.0 in the coming years as fraudsters move from generalised attacks to an increasing focus on more targeted ATO attacks. This approach replaces mass credential stuffing with more targeted exploitation that could yield higher returns for the fraudster and drive increased fraud losses for FIs. This is a critical future area for FIs, as customers experiencing ATO will experience a loss of trust in their provider, regardless of fault, and the organisational cost of remedying an ATO attack is significant.

Cybercriminals constantly evolve their tactics and employ new ones to breach consumers' accounts. Increasingly automated methods, such as credential stuffing, complex scripts, and bots, make fraud even easier to deploy. In addition to targeting consumers, account takeover is increasingly used to steal employee user credentials. It is often the easiest path to access sensitive information within organisations.

Bots have made these tactics extremely scalable so cybercriminals can hit more targets or place greater focus on a single target. The increasing use of bots leads to more brute-force attacks that span the web and deploy stolen credentials against accounts.

In addition, the legitimate owner is not likely to be initially informed or aware of their account takeover. Often, it takes time until they realise the damage, but by then, the perpetrator will have disappeared.

ATO can be challenging to detect because fraudsters can hide behind a customer's positive history and mimic normal login behaviour. Continuous monitoring provides the ability to detect signs of account takeover fraud before it begins.

An effective fraud detection system will give financial institutions full visibility into a user's activity before, during and after a transaction. The best defence is a system that monitors all activities on the bank account because before a criminal can steal money, they must perform other actions, such as setting up a new payee. Monitoring all the actions on an account will help identify patterns of behaviour that indicate the possibility of account takeover fraud.

This fraud detection system can also assess risk based on data such as location. For example, if a customer first accesses their account in North America and then again 10 minutes later from Europe, it is clear that it is suspicious activity and could indicate that two individuals are using the same account. If there is a risk of ATO fraud, the fraud prevention system will challenge the person transacting on the account with a request for additional authentication. This could include using an adaptive authentication or an Intelligent Adaptive Authentication approach.

Introducing darknet markets makes account takeover fraud much more attractive to attackers. Attackers no longer need to steal directly from targeted users, reducing liability. Attackers who want to steal directly from targeted users can simply purchase valid accounts on darknet markets instead of performing the arduous task of cracking passwords.

FRAUD DETECTION TO BE PRIORITISED IN UNBANKED AND UNDERBANKED

Unbanked and underbanked populations do not have bank accounts and must rely on alternative financial services outside the banking system.

Over the years, fintech companies have developed products to help fill this gap. They have also started offering products that can be used by the unbanked, such as mobile money services or other apps or services that can be accessed more easily. With more innovative financial product roll-outs expected in the next two to three years, the fraud risk in this area will also grow.

There needs to be an increase in the use of alternative data to identify fraud risks for the unbanked. Unbanked consumers do not have or have very limited banking or credit data. However, the alternative data can be used to analyse behaviour patterns and verify identity, which includes rent payment, mobile phone payment, employment and payroll information, utility bills etc. Increased frequency and scale of scams and sophistication of social engineering techniques will target unbanked consumers. Most unbanked consumers are not as educated in financial products, as this will be their first time using them.

These unbanked and underbanked customers are also more likely to fall for fraud scams and become victims of malware and other fraud-enabling technologies. Fraudsters will take full advantage of this situation with increased fraud attacks. Therefore, an increased focus must be on embedding security measures in the product/application design. Building a highly secured mobile application is essential for the success of financial products, as they host sensitive personal information and process payment transactions. The most effective way to ensure the

security of the applications is to embed all necessary security measures during the product design and development phases. These include biometric access, MFA (Multi-factor Authentication), and adaptive authentication, which generate authentication steps based on risk profile and behaviour analytics.

BNPL I. BNPL FRAUD

With the increase in BNPL comes the introduction of BNPL fraud. This occurs when a fraudster infiltrates an existing BNPL account and uses it to make unauthorised purchases or leverages synthetic identity information to open a new BNPL account. As BNPL grows, fraudsters are finding more ways to exploit this innovative form of financing.

Some fraudsters open fake BNPL accounts using stolen or synthetic identity information. Some take over existing BNPL accounts using stolen login credentials to make unauthorised purchases. Banks, credit card companies and platform providers can lose 100% of a loan's value through fraud.

The most popular form of BNPL fraud occurs through account takeover. With the dark web awash with stolen or breached login credentials, cybercriminals can easily access the logins they need to infiltrate accounts and go on illegal shopping sprees. Not only is the victim left to pay the bill, but a BNPL account takeover can lead to a much larger financial issue.

BNPL triangulation fraud schemes involve fraudsters offering discounted prices for products online. Customers pay an agreed amount, and the fraudsters place an order using BNPL. After that, the fraudster will open a dispute with the provider. Because providers and merchants have separate systems, fraudsters can often easily receive the full funds without being discovered.

BNPL FRAUD PREVENTION SOLUTIONS

There is a range of solutions that can help combat the rising issue of fraudulent activity within the market. One is to introduce more extensive background and credit checks to guarantee that the credentials being used are legitimate. Another method is for BNPL firms to ensure that a comprehensive anti-fraud strategy is created as part of the overall business plan and model. Investing in a proactive rather than reactive solution is of high importance. This should include several commonly witnessed indicators of fraudulent activity that are automatically flagged and investigated.

AI can also help conduct extensive background checks without necessarily affecting consumers' credit scores to reduce the number of approved fraudulent accounts. This information can then be shared with the industry, complying with data protection legislation, to amplify the database.

MARKET SUMMARY:

GLOBAL ONLINE PAYMENT FRAUD VALUE

Merchant losses from online payment fraud will exceed $362 billion globally between 2023 to 2028, with losses of $91 billion alone in 2028. A rise in eCommerce transactions in emerging markets is driving this growth. Merchants

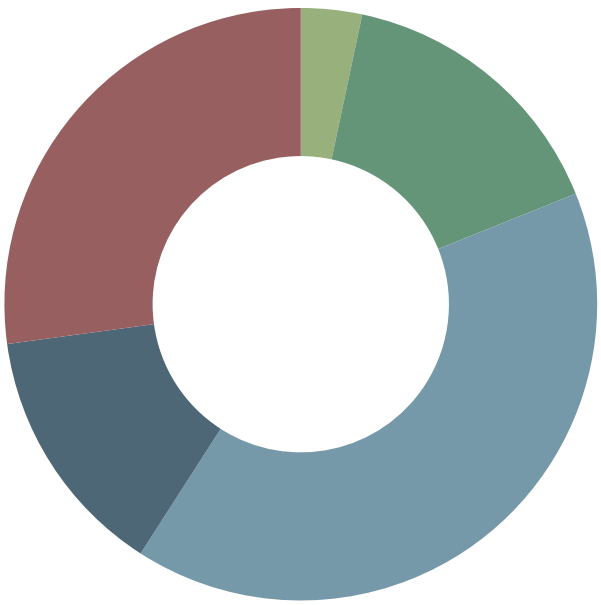


Figure 1: Global Online Payment Fraud Value in 2028: $91 Billion

face new threats, such as the increased use of AI for attacks. Online payment fraud is where cybercriminals conduct false or illegal transactions online, using several fraud strategies, such as phishing, business email compromise or account takeover.

- Underpinned by a robust scoring methodology, the new Competitor Leaderboard ranked the top 21 fraud detection and prevention vendors, using criteria such as the relative size of their customer base, their solutions' completeness and future business prospects.

THE TOP 5 VENDORS FOR 2023:

1. LexisNexis Risk Solutions
2. Experian
3. ACI Worldwide
4. Visa
5. FICO

- Leading players scored well based on the breadth of their anti-fraud orchestration capabilities and their use of AI for analysing trends in fraudster behaviour. To stay ahead of the competition, vendors must utilise data collected throughout the eCommerce process to further develop their fraud detection and prevention solutions through training and advancing AI models.
- eCommerce payment vendors must offer dashboards and data visualisations to their smaller SME customers. At present, SMEs lack access to good customer analytics, and this data could highlight consumer purchasing behaviours and provide insights into payment method popularity and fraud. eCommerce payment vendors can differentiate their portfolios in an increasingly competitive and commoditised market. wn

TECHNOLOGY AND INNOVATION REPORT 2023

OPENING GREEN WINDOWS

Technological opportunities for a low-carbon world

As the human and economic pain caused by the pandemic remains fresh for the most vulnerable in the Global South, geopolitical disruptions and environmental threats confront developing countries with an unprecedented combination of food, fuel, and finance crisis. Years of efforts towards the achievement of the Sustainable Development Goals are being lost.

Against this somber background, the Technology and Innovation Report 2023 argues that the wave of technological change unleashed by renewable and other green technologies opens new windows of opportunity for the Global South to build resilience against threats, grow stronger and more diversified economies and move to better development trajectories with a smaller burden for the environment.

The report covers seventeen frontier and green technologies, ranging from artificial intelligence and the Internet of things to green hydrogen and electric vehicles. It estimates that together, these technologies can grow from a market value of $1.5 trillion in 2020 to over $9.5 trillion by the end of the decade.

But unless developing countries take decisive action soon, most of the value generated in those booming markets will escape them.

The report examines possible national strategies and recommends a set of international support measures that can help prevent that outcome.

The report also includes a frontier technology readiness index that gives insights about specific actions that countries can take to perform better in the race to catch this wave of technological change.

GREEN WINDOWS OF OPPORTUNITY

In 2023, the world faces severe social and economic challenges. While trying to recover from the COVID-19 pandemic, many countries are now coping with the repercussions of the war in Ukraine, which has not only caused immense suffering but has also heightened geopolitical tensions and created threats to global trade and energy and food security.

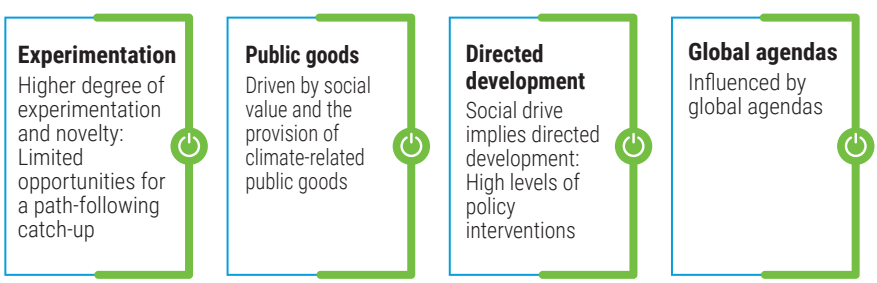
The most difficult choices are in developing countries where this conjuncture of crises threatens hard-won development gains. To eliminate poverty, they need diversified and more productive economies to create more and better jobs and boost household incomes. But faster economic growth will demand far more energy which, if sourced from fossil fuels, would send millions of tons of carbon billowing into the atmosphere.

Developing countries need not, however, follow the historical pathways of carbon-fuelled growth – if the global community is committed to equitable

social, economic and technological transformations guided by the Sustainable Development Goals.

The 2023 edition of the Technology and Innovation Report focuses specifically on what can be achieved by technological innovation, by opening 'green windows of opportunity.' It does not suggest that these problems will be solved by technology alone, nor that new technology is necessarily beneficial – since the gains for one group can be detrimental for others. But it does argue that innovation and advances in science and technology, if guided by the Sustainable Development Goals, can be used to drive the world along more sustainable and equitable pathways, particularly in the generation and use of energy.

The report is built around the concept of green innovation – creating or introducing new or improved goods and services that leave lighter carbon footprints and open up green windows of opportunity. Developing countries now have opportunities to catch up, reduce poverty, and at the same time help tackle climate change and set the world on a more sustainable course.
For countries aiming to catch up with the more technologically advanced countries, switching green requires more than simple imitation; it demands creative adaptation and innovation. The pathways are likely to differ substantially from those taken by advanced economies. The figure below sets out the four main components of green innovation. The starting point is experimenting with new ideas and technologies and adapting these to local circumstances, values and priorities (Figure 1). To take advantage of these ideas, countries will need the appropriate infrastructure and in the form of public goods – through direct government intervention, supporting the establishment of new green sectors, for example, or introducing regulations such as on air or water pollution. Green innovation is also influenced by global agreements and agendas, rules, and mechanisms, especially those related to climate change, such as the Paris Agreement.



Source: UNCTAD.

Figure 1: The sequence for opening green windows

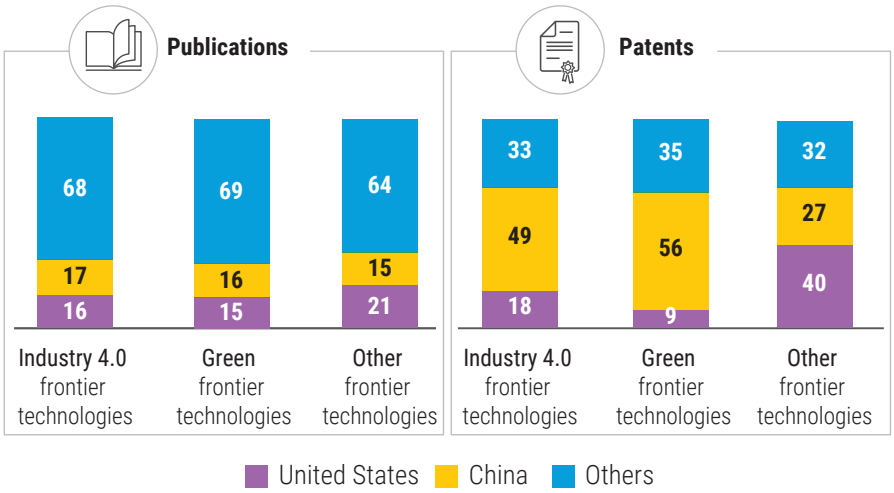
MOVING FAST WITH FRONTIER TECHNOLOGIES

At the leading edge of green innovation are new and rapidly developing technologies that take advantage of digitalization and connectivity. The Report examines 17 of these 'frontier technologies' – from artificial intelligence (AI) to green hydrogen to biofuels – highlighting their potential economic benefits and assessing country capabilities to use, adopt, and adapt these innovations.

These technologies have experienced tremendous growth in the last two decades: in 2020 the total market value was $1.5 trillion and by 2030 could reach $9.5 trillion. Around half of the latter is for the Internet of things (IoT) which embraces a vast range of devices across multiple sectors. These technologies are supplied primarily by a few countries, notably the United States, China and countries in Western Europe.

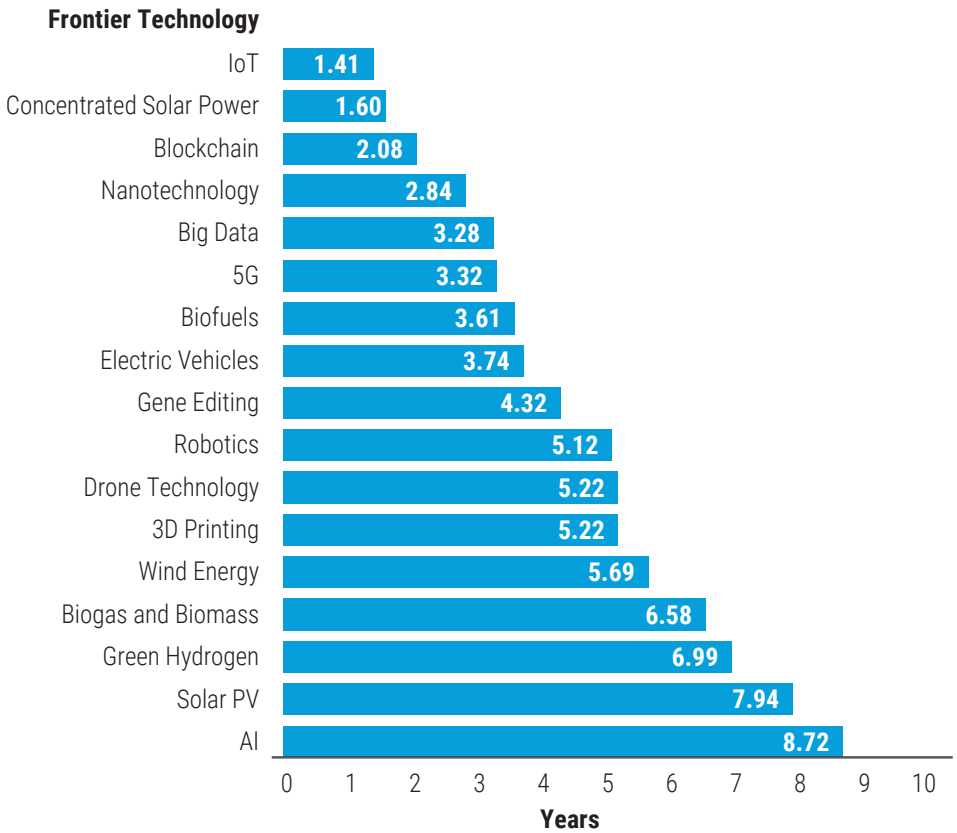
As with previous waves of automation, frontier technologies are both destroying old jobs and creating new ones. Current job expectations may be more pessimistic because of the increasing capacity of AI to mimic human intelligence. Nevertheless, most alarmist scenarios often fail to take into account that not all tasks in a job are automated, and, most importantly, that technology also creates new products, tasks, professions, and economic activities throughout the economy. The net impact on jobs will depend on the final balance between creation and extinction.

For these new technologies, the knowledge landscape is dominated by the United States and China, with a combined 30 per cent share of global publications and almost 70 per cent of patents (Figure 2). Other countries compete in specific categories, notably



Source: UNCTAD calculations based on data from Scopus and PatSeer.

Figure 2: Country share of publications and patents, by frontier technology (percentage)



Source: UNCTAD.

Note: For each technology, the number in the bar graph shows the patent maturity, which is the difference between the weighted average patent application year and the weighted average year of the 20 most cited patents between 2000 and 2021.

Figure 3: Patent maturity of frontier technologies

France, Germany, India, Japan, the Republic of Korea, and the United Kingdom.

All these technologies are at the frontiers of change, but some are more mature than others, as is evident by the record of patents and publications. On the basis of the years in which patents were first sought and the period over which the original patents were subsequently cited, the most mature technology is AI. Most patents for this technology were applied for in 2014 and cite patents on average from 2005, producing a difference of around 9 years. This may seem counterintuitive. But today's AI patents, such as those for autonomous vehicles and the metaverse, are technologically closer to those for search engines and digital maps, and many of the underlying principles patented in 2005 are still valid.

IoT, on the other hand, is relatively immature, with an average patent application year of 2017 and an average citation date of 2016. This suggests that the dominant design behind IoT innovation is being updated almost yearly, reflecting a technology that is still evolving fast.

For developing countries that need to catch up, the more mature technologies may seem simpler and more affordable options since they demand less research and development. Biomass and solar PV, for example, have well-tested technologies that latecomers can absorb and use with imported machinery from the outside. For solar PV, for example, China initially imported foreign production machinery and benefited from economies of scale. However, these markets may now be more difficult to enter since the incumbents will have developed strong and efficient production processes and are able to trade internationally at more competitive prices.

LAYING THE FOUNDATIONS

If developing countries are to capture the economic gains associated with new technologies, their firms must have the required capabilities. This includes not just scientific or technical skill, but also the necessary policies, regulations, and infrastructure. To assess national preparedness to equitably use, adopt and adapt frontier technologies, this report presents the 2023 results of the 'readiness index' that combines indicators for ICT, skills, R&D, industrial capacity and finance. This ranking for 166 countries is dominated by high-income economies, notably the United States, Sweden, Singapore, Switzerland, and the Netherlands. The second quarter of the list includes emerging economies – notably Brazil, which is ranked at 40, China at 35, India at 46, the Russian Federation at 31, and South Africa at 56. China's lower-than-expected position in the ranking, when compared with its productive and innovative capacities in frontier technologies, is due to urban-rural disparities in Internet coverage and broadband speed. Further behind are countries in Latin America, the Caribbean, and Sub-Saharan Africa, which are the least prepared to use, adopt and adapt frontier technologies and are at risk of missing current windows of opportunity.

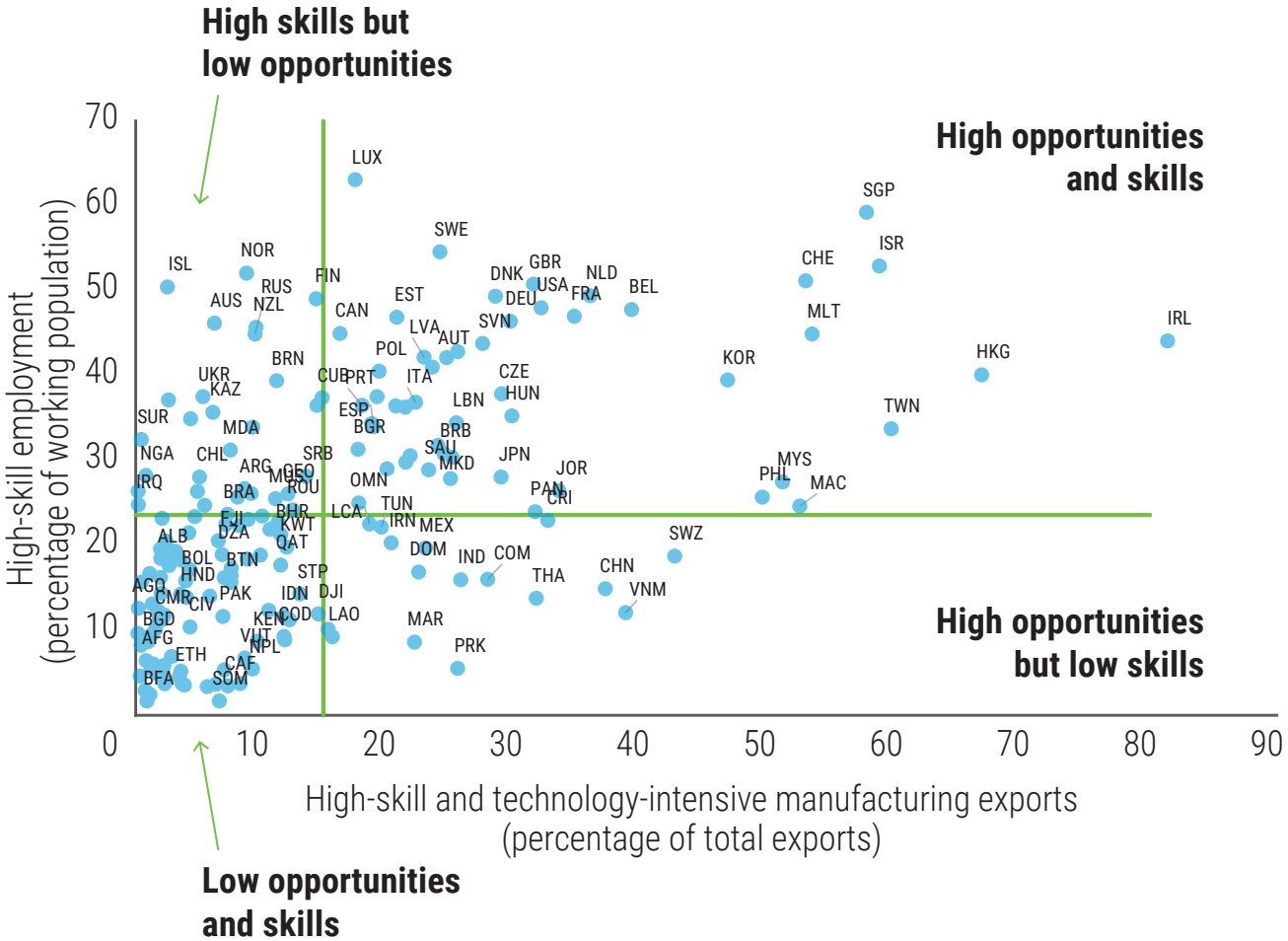
Data on individual components of the index highlights areas that need to be improved. Overall, developing countries as a group have lower rankings for their indicators on ICT connectivity and skills. The LDCs, LLDCs, and SIDS rank lower than 100 for all the indicators, with particular weaknesses in ICT infrastructure and research & development.

The countries best placed to move to smart production are those with higher levels of skill and stronger manufacturing industries. The figure below shows the balance between workforce skills and market opportunities – based on high-skill and technology-intensive manufacturing exports as a percentage of total exports, and high-skill employment as a percentage of the working population.

WINDOWS OPENING AND CLOSING

For developing countries and specific renewable energy products, the rapidly changing technological scene offers green windows of opportunity. Countries should take advantage of these now, if possible, since they are likely to close as other countries take over the markets. Otherwise, they may be firmly locked into fossil-fuel pathways, leaving the markets entirely to foreign investors. Much depends on the national preconditions and capacities and willingness to take opportunities and respond strategically as they arise. Looking at renewable energy technologies, there is significant variability in catch-up trajectories at the sector and country level. The table below considers four scenarios – illustrating which windows have been open, or are within reach, and countries and technologies that have taken advantage of them.

The best scenario is the one in which strong preconditions are combined with strong responses. For green hydrogen in Chile, for example, the country has adequate preconditions and can show a strong response in development of the technology. Brazil, on the other hand, is in a strong position for biofuel. It has a long history of sugarcane cultivation and from the 1970s started to make significant investments in the technologies, while creating demand, and establishing a supportive framework. With that, the country has managed to catch up and become a global leader both in terms of technology, usage of ethanol, and fuel exports.



Source: UNCTAD (2022). Industry 4.0 for Inclusive Development (United Nations publication, Sales No. E.22.II.D.8, New York and Geneva).

Note: The solid lines represent the global unweighted averages under these two indicators. Data labels use International Organization for Standardization economy codes.

Figure 4: Readiness to benefit from the diffusion of Industry 4.0

However, the lack of strong preconditions does not mean that the window of opportunity is closed. Much depends on the responses at different levels of government and the involvement of various public and private stakeholders.

For example, the Thai government addressed weak initial preconditions for biofuel through strong policy responses. Countries should surpass their initial constraints if they want to reap economic gains. While the opportunities differ greatly from one renewable energy technology to another, there are two main stages for countries switching green.

The first is to identify and open windows of opportunity, based on the availability of natural resources, such as favourable wind conditions, and using policies to boost demand and national capacity to use or build the necessary technology. The second is to assess what is needed to sustain the processes. There are also likely to be feedback loops requiring regular adjustments.

PATHWAYS TO MORE COMPLEX AND SUSTAINABLE PRODUCTION

The best direction for developing countries is to switch to products that are more complex,1 have greater value added and lower carbon footprints.

In most low-income developing countries, economic diversification involves emulating industries in more developed countries – a steady progression that builds on existing industries – it is thus 'path-dependent.' If a country already has the capacity

Responses / Readiness	Strong	Weak
Strong	**Scenario 1: Windows open** Solar PV, Biomass, CSP – China Bioethanol – Brazil Hydrogen – Chile (potentially)	**Scenario 2: Windows to be open** Solar PV – India Biogas – Bangladesh CSP – Morocco Wind – China
Weak	**Scenario 3: Windows within reach** Biomass – Thailand and Viet Nam Hydrogen – Namibia	**Scenario 4: Windows in the distance** Wind – Kenya Bioenergy –Mexico and Pakistan

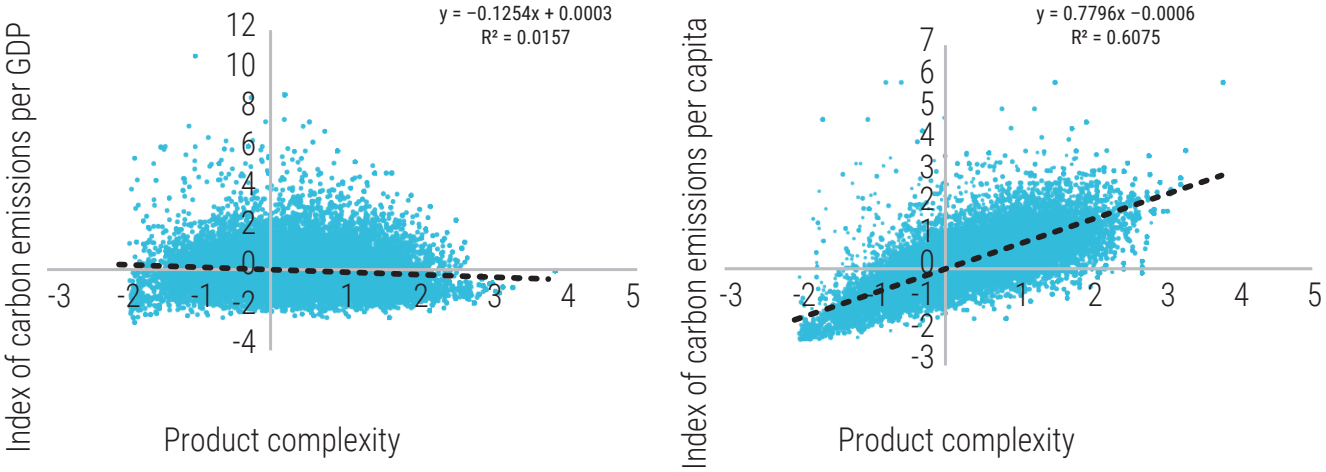
Source: UNCTAD.

Table 1: Four green window scenarios

for manufacturing medium and high technology products, it is in a stronger position and can move in a number of directions. But if it is largely producing primary products, it has fewer starting points. If basic technologies need to be learned or transferred from abroad, then innovation is likely to require greater government support. But whatever path they choose for switching green, governments in low and lower-middle-income developing countries have to act fast and decisively; otherwise, they will be left further behind.

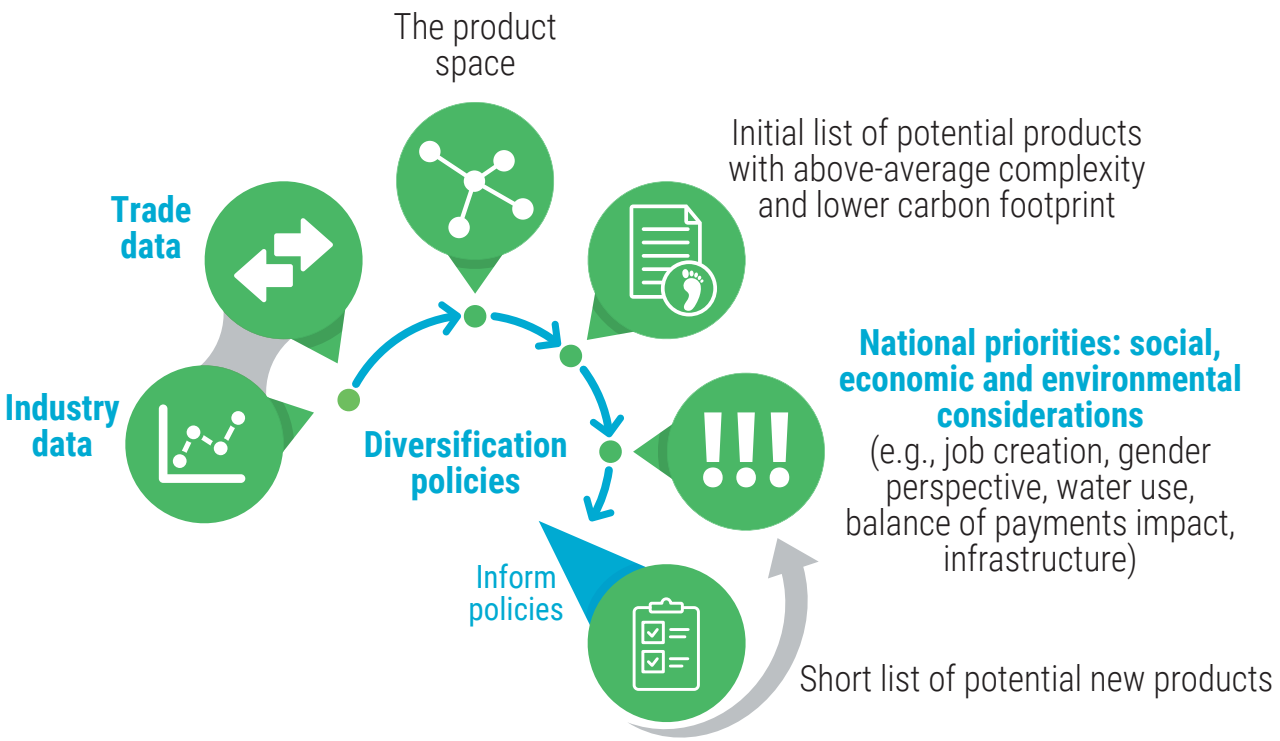
Generally, as countries move from agriculture to industry, and to medium and high-tech manufacturing, complexity increases. But this does not necessarily lead to greener production. The less-complex sectors that also have lower carbon footprint include textiles, vegetable products, foodstuffs and footwear. The sectors that are more complex and have higher carbon footprints include chemicals and allied industries, metals and mineral products. However, much will depend on the product mix, because within each industry, one can find products in a range of carbon emissions - from below to above the global average.

To help countries choose greener pathways UNCTAD has produced indices of economic complexity and carbon footprints for 43,000 products exported in international markets. As the product mix becomes more complex and more sophisticated, carbon emissions can fall per unit of GDP, though if more products are being produced for more people total emissions will rise (Figure 5).



Source: UNCTAD.

Figure 5: Association between carbon footprint and product complexity, 2018



Source: UNCTAD.

Note: Product space is a network representation of the similarity between products traded in the global market in terms of the technology required for their production.

Figure 6: Selecting realistic opportunities for diversification

For selecting more complex and greener directions, governments should strengthen national capacities for analysing new sectors (Figure 6). This will mean taking stock of the country's existing technological and productive capacities and the availability of natural resource such as wind or agricultural waste. The evaluation can also take advantage of international tools, such as UNCTAD's Catalogue of Diversification Opportunities 2022. They also need to consider how they can fit into global value chains. And as the windows of opportunity open, policymakers should be prepared to adjust their institutional frameworks.

TWIN TRANSITIONS FOR GLOBAL VALUE CHAINS – GREEN AND DIGITAL

For most countries their capacity for moving to complex and greener products will depend on trade – on how they can fit into global value chains (GVCs). By participating in GVCs, countries can diversify by producing and exporting parts and components of final products or by upgrading existing output to have greater value added.

The greening of GVCs in manufacturing industries is driven by 1) national environmental legislation and trade agreements including environmental provisions, 2) new patterns of demand preferences and consumer behaviours, and 3) new technologies inducing efficiency gains to meet greener demand requirements. These drivers can open green windows of opportunities for firms in latecomer countries involved in GVCs, but seizing these opportunities is not automatic and the failure to do so may leave enterprises worse off than before.

GVCs can become greener through two main routes. The first is by manufacturing the goods used for green production, such as solar PV panels and wind turbines. The second is by greening traditional manufacturing industries, such as food, garments and textiles, leather and shoes, and furniture.

Greening of traditional GVCs can be achieved by switching to digital frontier technologies associated with smart manufacturing – often referred to as Industry 4.0. For example, data collected from online-connected sensors, and from GPS tracking systems, can optimize logistics and significantly reduce carbon emissions.

So far, digital technologies have only diffused slowly in most of developing economies. Manufacturing companies more likely to use Industry 4.0 technologies are found in the more advanced economies. Countries with largely lower-skilled labour are less likely to benefit. There are also differences between companies – in many developing countries, only a minority of larger companies tend to adopt digital technologies; while the majority are still confined to analogue production. To promote the twin transition of green and digital, latecomer countries will need to build digital competency along with the necessary infrastructure and institutions, while building innovation capacity and overcoming financial barriers.

Within value chains, governments can consider targeted policies, such as support for small and medium-size enterprises with finance for new machinery and other requirements for upgrading. They can also create training or technology demonstration centres as well as industrial institutes.

As they upgrade, companies and countries should embed strong social and environmental values. Social upgrading refers to improving the rights and entitlements of workers and their employment. Environmental upgrading refers to a firm's ecological footprint, including its use of natural resources, its emission of greenhouse gases and its impact on biodiversity. These ideals are increasingly being demanded by consumers who are seeking more ethical products, as well as by governments and others who now have more exacting social and environmental standards.

Upgrading value chains can be based on voluntary sustainability standards (VSS) which have emerged mainly through collaboration among NGOs, industry groups or multi-stakeholder groups. By 2020 there were 150 VSS in agriculture, and around 30 for mining and industrial products.

PRIORITIES FOR OPENING GREEN WINDOWS

For opening green windows, governments need to assess the current conditions and then strengthen sectoral innovation systems. Much of this happens within 'green industrial policy,' which mainly involves mobilizing the necessary actors and resources and directing how knowledge capacities are upgraded – often amid considerable technological, economic, and political uncertainties.

The report identifies a set of priorities for latecomer countries. They can build digital competency along with the necessary infrastructure and institutions, while strengthening innovation capacity and overcoming financial barriers. This requires collaboration between the private sector and other stakeholders.

A lead agency within government should mobilize resources and convene stakeholders to assess overall state capacity in the areas related to the new technology, as well as the strengths of relevant public agencies, particularly for regulation, extension support systems, and for providing required public services. Overall policy should be mission-oriented – going beyond levelling the playing field to fixing market failures and involving broader

programmes of market co-creation and shaping.

In industries where the technology is more mature, as with wind and solar, it may be difficult for latecomers to produce core components. But there can be opportunities further down the value chain related to deployment, such as project development, engineering, procurement and construction.

Governments need to assess at various stages where and how production and innovation should be strengthened and changed. To do so, they can take advantage of UNCTAD's Science, Technology and Innovation Policy reviews which cover the activities of national and local governments, private companies, universities, research institutes, financial institutions, and civil society organizations.

While the options differ from one country and company to another, there are some common priority areas.

SET THE DIRECTION

ALIGN ENVIRONMENTAL AND INDUSTRIAL POLICIES

Governments need transformational agendas to mitigate climate change, commit to renewable energy production and consumption, electrify rural communities, and increase energy security. Policies that might previously have been developed in separate domains need to be co-created across the energy-environmental and industrial spheres. This requires a whole-of- government approach involving ministries of education, industry, trade, to cultivate design and engineering capabilities and prepare the economy and businesses for responding.

INVEST IN MORE COMPLEX AND GREENER SECTORS

The government, the private sector and other stakeholders should develop the capacities and build the institutions to continuously and strategically identify new technologies and sectors for diversification that are more complex and greener. The priority sectors should be supported through vertical policy instruments such as clusters, smart specialization initiatives, pilot and demonstration projects and areas, and the associated finance.

The government and the private sector should also expand financing opportunities for developing and commercializing green technologies. These can include Investment funds for green technology, technical assistance in innovation and technology, and advisory services. To encourage the private sector, both government and donor agencies should come forward as early investors. These activities can be complemented by foreign direct investment.

BUILD CONSUMER DEMAND

Governments can offer the incentives and infrastructure that help shift consumer demand to encourage recycling and the circular economy. This can be supported by green procurement to create a ripple effect across the rest of the economy.

BUILD GREEN PRODUCTIVE AND INNOVATIVE CAPACITIES

Invest in R&D

Nascent green technologies usually require significant investments in R&D. Governments can offer subsidies to build up research, with the collaboration of universities and industry, both domestic and foreign. Public R&D investments are also needed in process improvements and complementary technologies. And when technologies are rapidly evolving, as in the wind industry, this investment will need to be continuous. In the early stages, when the domestic market cannot support a competitive industry, governments can set up technology demonstration projects.

Raise awareness of green technologies

The government, private sector and other stakeholders should create greater awareness of the potential of green technologies. This should start within basic education, along with campaigns to inform the private sector and consumers of the benefits of these technologies and their capacity to reduce carbon footprints. Within firms, technical education and skills development upskill and prepare the manufacturing sector to adopt green technology.

Organized civil society is also important for sensitizing the public about the significance of green technology. Civil society organization can support transfer of knowledge and capacity development activities for farmers and other small businesses. They can also start pilot projects that can be scaled-up by governments. Civil society organizations and the academia can serve as incubators or accelerators for young entrepreneurs interested in starting businesses in green agricultural technologies.

Develop digital infrastructure and skills

As these technologies progress, all countries will need stronger digital infrastructure, in particular high-speed and high-quality Internet connections. This will mean public and private investments in ICT infrastructure along with regulations to foster competition in the telecommunications sector. Governments should also address the connectivity gaps between small and large firms and between urban and rural regions. Some technologies, such as drones, may also need specific regulations.

Skills are needed for adopting existing technologies, for basic use, for adapting these technologies, and finally for creating new ones. For developing countries, it is particularly important to have the capacity to adapt and modify technologies since these are likely to be used in circumstances different from those in which they were originally developed.

Governments should support businesses, including SMEs, to help them build digital skills in areas such as market research, product development, sourcing, production, sales, and after-sales services. Special consideration should be given to women in informal and artisanal small and microenterprises, particularly for entrepreneurs. Countries also need to reduce brain drain, retain skilled professionals, and attract skilled expatriates.

INTERNATIONAL COLLABORATION FOR MORE SUSTAINABLE PRODUCTION

In developing countries, opening green windows is unlikely to happen naturally as a result of businesses seeking greater efficiency and profits; it has to be the consequence of deliberate government action.

The least technologically able countries cannot seize green opportunities without the support of the international community and official development assistance. This should be based on equitable partnerships – to build local innovation capabilities and marshal the necessary technologies. Collaboration on innovation not only transfers capital goods and equipment, it also enables people to develop the skills needed to operate and maintain the equipment (know-how) and understand why it is running (know-why). Green technologies typically need more adaptation to local conditions.

Empowering developing countries for switching green thus requires broad and comprehensive development strategies that can deal with multiple tensions and develop partnerships for common public goods.

COOPERATION THROUGH INTERNATIONAL TRADE

Given the extent to which the production and consumption of products related to green technology are traded internationally, much will depend on the conditions on which this trade takes place. Trade rules should, for example, permit developing countries to protect infant green industries through tariffs, subsidies and public procurement – so that they not only meet local demand but reach the economies of scale that make exports more competitive. There should also be requirements for local content though these need to be carefully managed and deliberately sequenced so as to avoid the pitfalls that earlier industrial policies faced in most developing countries.

To support these efforts, the World Trade Organization can review trade rules to make them more consistent with the Paris Agreement. However, member countries can also take steps within existing WTO rules. Countries with larger domestic markets, for example, can subsidize nascent sectors for components for domestic solar and wind energy products. They can thus start producing for import replacement while strengthening capacity for exports, by improving trade facilitation, and ensuring a stable and competitive exchange rates that would have effects similar to those of export subsidies.

The international community should also be innovative and propose new and bold trade mechanisms to support the development of innovation and technological capacity in developing countries for cleaner and more productive production. Developed countries can use development assistance to help countries to emulate the production of more advanced countries. On the demand side, developed countries should open their markets to production from latecomer economies. Identifying the products and countries that should benefit from such a proposal would, however, probably need a new institutional structure. A pilot could be an international programme of guaranteed purchase of tradable green items – such as products, parts and components used for renewable energy.

REFORM OF INTELLECTUAL PROPERTY RIGHTS

When the developed economies were producing new products and catching up with Britain after the Industrial revolution, or when a few Asian countries started upgrading their productive and innovative capacities – they were often copying production processes with or without permission. Now the intellectual property rights (IPR) regime is tighter, making it harder for new producers to break in. The international IPR system should be reformed to enable governments in developing countries to manage their systems to support climate action, based on the needs of different sectors and different stages of development. Manufacturers in technologically weak and less diversified countries should be allowed to imitate the production of more technologically advanced economies.

The principle that sustainable development should take precedence over commercial objectives was demonstrated during the COVID-19 crisis. In 2022, the WTO allowed eligible Members until 2027 to produce and supply vaccines without the consent of the patent holder to the extent necessary to address the COVID-19

pandemic. Similarly, flexibilities in the TRIPS Agreement should be given for environmentally-sound technologies to make the trade regime more consistent with climate change agreements.

PARTNERS FOR GREEN TECHNOLOGY

Global efforts should be put in place to accelerate the development and deployment of green technologies under the philosophy of common contributions to common goods. One ground-breaking model for this approach is the Intergovernmental Panel on Climate Change (IPCC). Others are the Paris Agreement of 2015 and the agreements for the Sustainable Development Goals. Even under such an approach, governance mechanisms should be put in place to avoid the North-South divide in knowledge management and ensure that developing countries' views and priorities are fully considered.

There are also successful examples of collective research whose results belong to all participating countries, particularly in natural sciences, including the European Organization for Nuclear Research (CERN), the International Thermonuclear Experimental Reactor (ITER) and the Square Kilometre Array (SKAO) project. Similar collaborations can also shape international cooperation for green innovations that equitably incorporate the views and priorities of developing countries.

MULTILATERAL AND OPEN INNOVATION

Most science, technology and innovation efforts are governed at the national level and generally reflect the priorities of developed countries. The international community can offset this bias by shifting research from the national to the multinational level. Such research should be based on open innovation – with all the results available to international experts and knowledge communities. A useful model is the Consultative Group on International Agricultural Research. Multilateral research can cover the whole value chain, or just a part of it. Research institutions could, for example, bring products or processes close to technology maturity and invite private companies to take care of rapid deployment. Or they might take concepts only to the laboratory stage or to early demonstration projects.

ASSESSING TECHNOLOGIES

Most technologies can have both positive and negative consequences depending on the local context and on how they are used. Each country needs to be able to assess the benefits and dangers of each technology according to their own needs, priorities and concerns. To date, technologies have largely been assessed either from the perspective of the developed countries or emerging economies. UNCTAD is currently carrying out pilot projects involving three African countries to build capacity for technology assessment. What is needed however is a more general multilateral system for assessing new technologies – such as AI and gene editing – based on the opportunities and risks they offer to different types of country. It could also consider how developing countries can be systematically supported to use such technologies.

REGIONAL AND SOUTH-SOUTH COOPERATION IN SCIENCE, TECHNOLOGY AND INNOVATION

Technological innovations to address the global climate crisis should increasingly be generated at transnational or even global levels. However, cooperation has been limited, even in issues in which countries in the same region often face similar problems. Researchers and investors in the poorer countries have little incentive to cooperate with their regional peers and are more likely to enter research projects with developed countries and emerging economies which can offer access world-class research and laboratories as well as computing power. Moreover, small and vulnerable countries also have limited domestic markets to attract local or international investment in the manufacture of goods related to green innovation. More technologically advanced developing countries should step up and strengthen efforts to promote regional and South-South cooperation for green innovation. Developed countries can support regional centres of excellence for green technologies and innovation – such as the Southern African Science Service Centre for Climate Change and Adaptive Land Management (SASSCAL) and West African Science Service Centre on Climate Change and Adapted Land Use (WASCAL).

A MULTILATERAL CHALLENGE FUND "INNOVATIONS FOR OUR COMMON FUTURE"

Successful innovation systems create multiple incentives for companies and entrepreneurs to develop their own ideas and transfer them to practice. However, most developing countries lack the financial or management capacities to develop similar incentives.

This Report proposes therefore a multilateral challenge fund "Innovations for our common future." Funded by international organizations, donors and international philanthropy the fund would mobilize creative thinking and stimulate innovations that could respond to many global challenges.

The next step would be to design a global green innovation competition. The criteria for assessing projects would be the extent to which they incorporate North-South and South- South STI cooperation for green innovation. wn

Download the complete report here.

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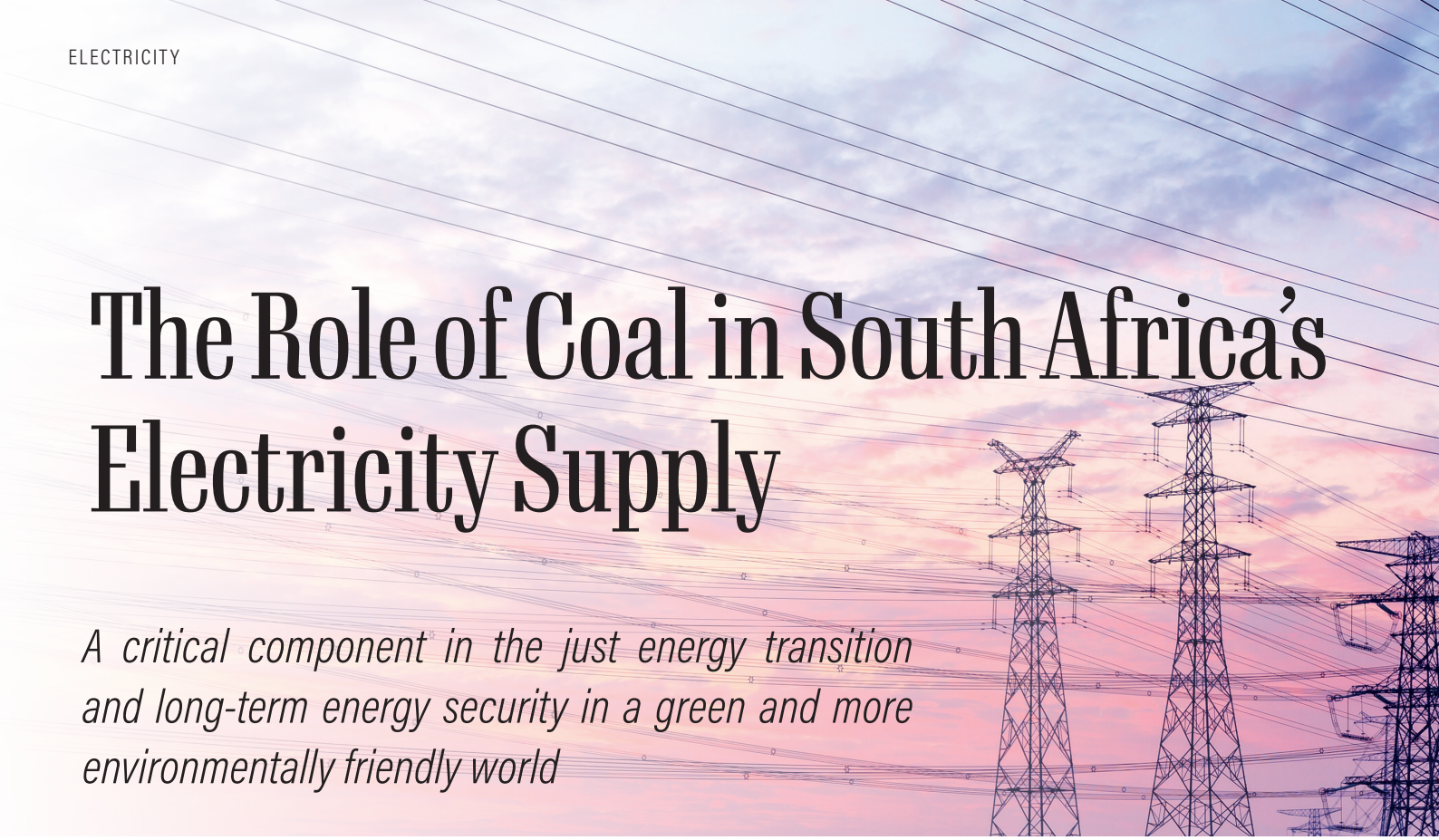


The Role of Coal in South Africa's Electricity Supply

A critical component in the just energy transition and long-term energy security in a green and more environmentally friendly world

South Africa is currently in the firm grip of a major electricity supply crisis which has been around for the last 15 years. The past year (2022) saw 200 days of load shedding, with 99 consecutive days. The current year will certainly beat the previous one regarding the number of days and total duration of load shedding. Still, the country must find long-term solutions to ensure the present difficulties are not repeated.

By: Kenneth Chitenhe SMSAIEE PMP BSc(ENG)Hons

The options should represent the best solutions given the country's socioeconomic conditions and global environmental concerns. There will always be trade-offs, but these must seek to maximise the benefit to the country whilst meeting our environmental obligations.

The current South African debate on resolving the electricity supply crisis is unnecessarily polarised, pitting those that religiously promote renewables as the panacea for all of humanity's energy needs against the side that wants to cling fiercely to coal and other fossil energy sources. After all, we have an abundance of coal and shale gas resources. What is even more alarming is that some of the loudest voices in the debate on both sides are often unqualified to speak at all or do so with a lot of zeal but very little knowledge. The zeal with very little knowledge has always been dangerous. Even more sinister is some asserting that a section of the vocal crusaders is paid to punt certain economic or business interests and political agendas.

South Africa finds itself in an interesting, if difficult, position. As the most industrialised nation on the African continent, it should be Africa's voice and play a leadership role in shaping global policy for the transition towards cleaner energy. However, for the most part, we still cannot sit down as equal players around the table. We are, therefore, consumers of policies which might not always work in our best socioeconomic interests.

THE OLD AND THE NEW

Much progress has been made with renewable energy technology, but we still don't understand a lot. We know some of the negative environmental impacts and are beginning to find sustainable solutions. Society will have to grapple with the headache of managing solar waste (panels, batteries etc.) in the future. Many of the processes of making the components required for renewable energy are inherently unfriendly or downright hostile to the environment. The wind is now an established form of renewable energy

with no harmful operational emissions. Still, we do not understand the impact of extracting such huge amounts of energy from the wind on the earth's climatic energy balance. We will learn as we make mistakes.

Furthermore, inverter-based resources (IBR) connected to the national grid have the undesired effect of affecting power quality and weakening the national grid. There is a lot of international effort and research to mitigate this. However, despite a serious push towards renewables, not enough attention is paid to this issue in South Africa.

Power utilities worldwide have been built on the foundation of dispatchable power. The absence of ease of dispatch ability is a major shortcoming of renewable energy. The sun doesn't always shine, and the wind doesn't always blow. Even when they are available, the intensity and strength are not constant. In the South African context, the winter season, the period of maximum electrical power demand, coincides with the period of lowest production from solar power plants. The average solar radiation during these months is about 200 watts per square meter, which is 50% of the peak solar radiation that South Africa receives during the summer months. The proffered solution is energy storage, and many options are on the cards, with the favourite being lithium battery storage, and this has gained a lot of momentum worldwide. Whilst costs have come down, grid-scale battery storage continues to be prohibitively expensive even for the rich nations, and this will continue for the foreseeable future. Other technologies exist but are still in the infant stages. Pumped hydro storage is a proven grid-scale energy storage solution, of which Eskom's 1,332MW Ingula Pumped Storage Scheme is a good example. However, South Africa is not geographically well endowed with sites for large pumped hydro schemes.

It is, therefore, crucial for the country to find the best way of providing baseload security, maintaining grid quality and strength whilst paving the way for an environmentally sustainable energy mix in the long run.

THE JUST ENERGY TRANSITION

One should not be blind to coal's proven negative environmental effects. Emissions from fossil fuels have been the dominant contributor to global warming. However, when coal-fired power stations were first introduced, the negative environmental impacts were unknown, let alone understood. This is the same position we find ourselves in as we introduce the current renewable technology. There is every possibility that future generations will look back at us and conclude that we exacerbated the global warming problem.

South Africa has embraced the concept of a just transition towards environmentally sustainable energy sources. This must acknowledge that the existing coal-dominated energy mix must gradually give way to greener sources in a way that provides the least negative socioeconomic impact on the country.

It is possible to manage the just energy transition to benefit the country or otherwise. This depends on the judicious use of our coal resources, centred around the ageing fleet of Eskom's coal-fired power stations. A plan is already underway to decommission seven power stations over the ten years leading to 2032. This has already started with the closure of Komati Power Station in October 2022. The plan is to repurpose it with 150 MW PV solar, 70 MW wind and 150 MW battery storage, funded by a loan from the World Bank. However, this proposed repurposing of the Komati Power Station replaces a nominal 1,000 MW of thermal electricity with 220 MW renewable generation. This represents a loss of 780 MW of fully dispatchable power to the grid, equivalent to almost a single load-shedding stage. Repurposing old coal-fired power stations should not be synonymous with a drastic loss of critical baseload capacity to the national grid.

Hopefully, some studies went into the repurposing of the Komati Power Station. Project information available on the Eskom JET website relates mainly to environmental and socioeconomic issues. It is unclear what studies if at all, went into determining the best financial and technological options for repurposing the power station given the country's current conditions.

CLEAN COAL TECHNOLOGY

South Africa has around 53 billion tonnes of proven coal reserves, estimated to last for the next 200 years at current production. It is the world's 5th largest coal exporter, with the top export destinations being India, Pakistan, China, South Korea, and Sri Lanka. Whilst such exports bring in much-needed foreign currency, the country must prioritise its domestic needs since coal will play a very important part in meeting the country's baseload requirements for the foreseeable future. The proposal to use coal as a bridge towards green energy can be made in an environmentally sensitive way by utilising clean coal technologies.

CARBON CAPTURE, UTILIZATION & STORAGE

A major portion of clean coal technology is carbon capture, utilisation, and storage (CCUS). This technology set can capture carbon dioxide from large point sources, such as power plants or industrial facilities, and store it underground or use it for other purposes. CCUS is accepted and acknowledged as a key technology for mitigating climate change and achieving net-zero emissions. The schematic in Figure 1 shows the main components of the CCUS framework.

The following is an extract from a publication of the International Energy Agency:

"CCUS carries considerable strategic value as a climate mitigation option. It can be applied in several ways and across various sectors, offering the potential to contribute – directly or indirectly – to emissions reductions in almost all parts of the global energy system. Consequently, progress in developing and deploying CCUS technologies in one sector could have significant spillover benefits for other sectors or applications, including technological learning, cost reductions and infrastructure development. The four main ways in which CCUS can contribute to the transition of the global energy system to net-zero emissions – tackling emissions from existing energy assets, providing a platform for low-carbon hydrogen production, a solution for sectors with hard-to-abate emissions, and removing carbon from the atmosphere – are detailed below.

Tackling emissions from today's power stations and industrial plants must be central to the global clean energy transition. Those assets could generate more than 600 $GtCO_2$ – almost two decades' worth of current annual emissions – if they operated as they currently do until the end of their technical lives. Together with the committed emissions from other sectors, this would leave virtually no room for any emissions-generating assets in any sector to meet climate goals – an inconceivable prospect as populations and economies worldwide continue to grow.

CCUS is the only alternative to retiring existing power and industrial plants early or repurposing them to operate at lower capacity utilisation rates or with alternative fuels. Retrofitting CO_2 capture equipment can enable the continued operation of existing plants and associated infrastructure and supply chains, but with significantly reduced emissions. This can contribute to energy security objectives in the power sector by supporting greater diversity in generation options and the integration of growing shares of variable renewables with flexible dispatchable power. Retrofitting facilities with CCUS can also help preserve employment and economic prosperity in regions that rely on emissions-intensive industries while avoiding early retirements and economic and social disruption. To illustrate the potential significance, Germany's plans to retire around 40 GW of coal-fired generation capacity before 2038 is accompanied by a EUR 40 billion (USD 45 billion) package to compensate the owners of coal mines and power plants as well as support the communities that will be affected (IEA Energy Technology Perspectives: Special Report on Carbon Capture, Utilization and Storage, 2020)."

CARBON CAPTURE

There are four basic systems for capturing CO_2 from fossil fuels and biomass. These include:

a. Capture from industrial process streams

CO_2 has been captured from industrial

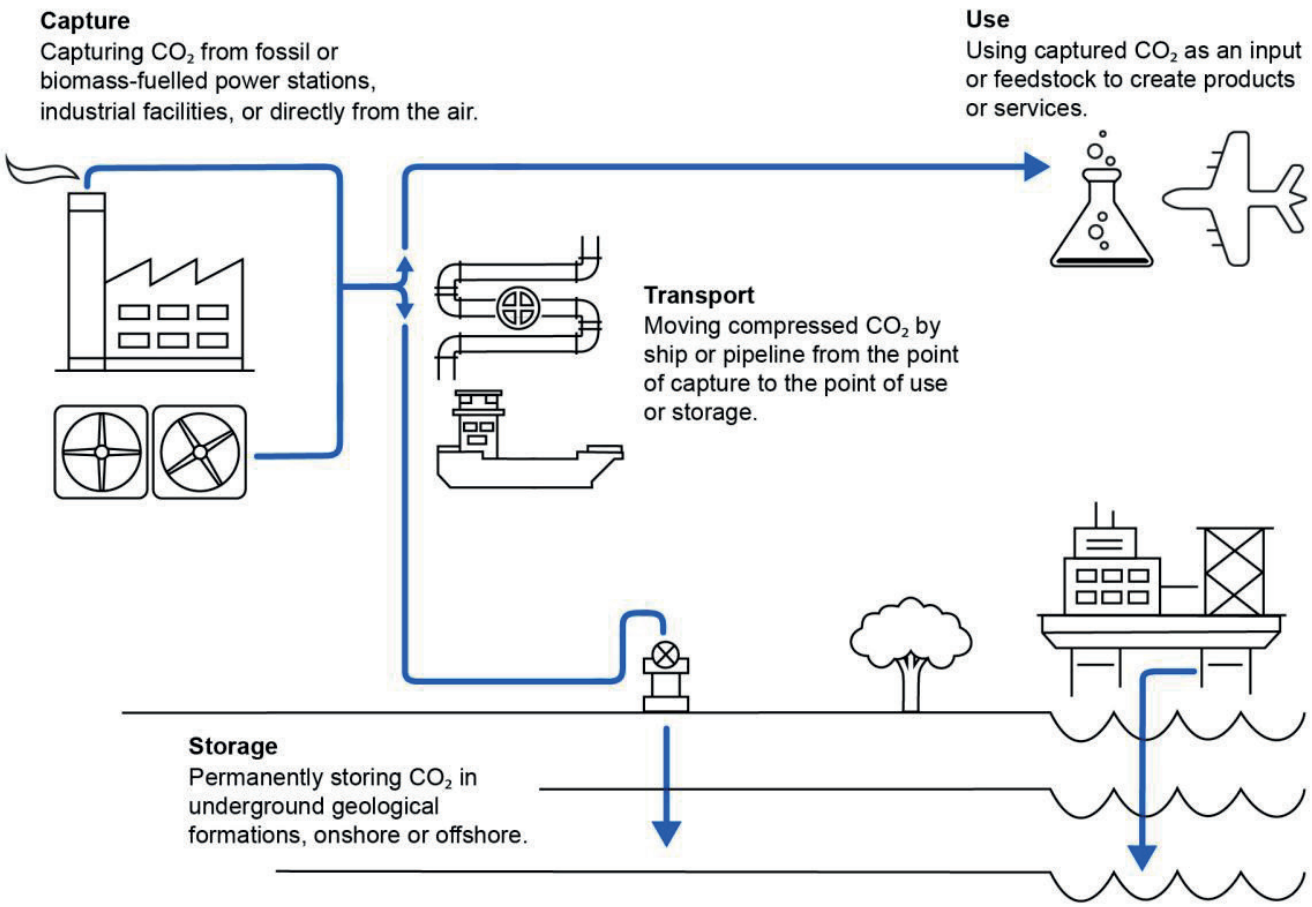


Figure 1: Carbon capture, utilisation, and storage (courtesy IEA)

process streams for decades. Current examples of capture from process streams include the purification of natural gas and the production of hydrogen-containing synthesis gas to manufacture ammonia, alcohol, and synthetic liquid fuels.

b Oxy-fuel combustion capture

Nearly pure oxygen is used for combustion instead of air, producing a flue gas, mainly CO_2 and H_2O. If fuel is burnt in pure oxygen, the flame temperature is excessively high, but CO_2 and H_2O-rich flue gas can be recycled to the combustor to moderate this. Oxygen is usually produced by low-temperature air separation. New techniques to supply oxygen to the fuel, such as membranes and chemical looping cycles, are being developed.

c. Pre-combustion capture

This involves reacting a fuel with oxygen, air, and steam to give mainly a 'synthesis gas (syngas)' or 'fuel gas' composed of carbon monoxide and hydrogen. The carbon monoxide is reacted with steam in a catalytic reactor, called a shift converter, to give CO_2 and more hydrogen. The carbon dioxide is then separated, usually by a physical or chemical absorption process, resulting in a hydrogen-rich fuel which can be used in many applications, such as boilers, furnaces, gas turbines, engines, and fuel cells.

d. Post-combustion capture

Post-combustion carbon capture is an established technology for emission reduction in commercial fossil fuel power plants worldwide. It involves the capture of carbon dioxide from flue gases produced by combustion. Instead of being discharged directly into the atmosphere, flue gas is passed through equipment which separates most of the CO_2. This is then fed to a storage reservoir, and the remaining flue gas is discharged into the atmosphere. A chemical sorbent process is normally used for CO_2 separation. Other techniques are also being considered, but these are not at such an advanced stage of development.

Figure 2 provides a summary of the carbon capture processes currently available.

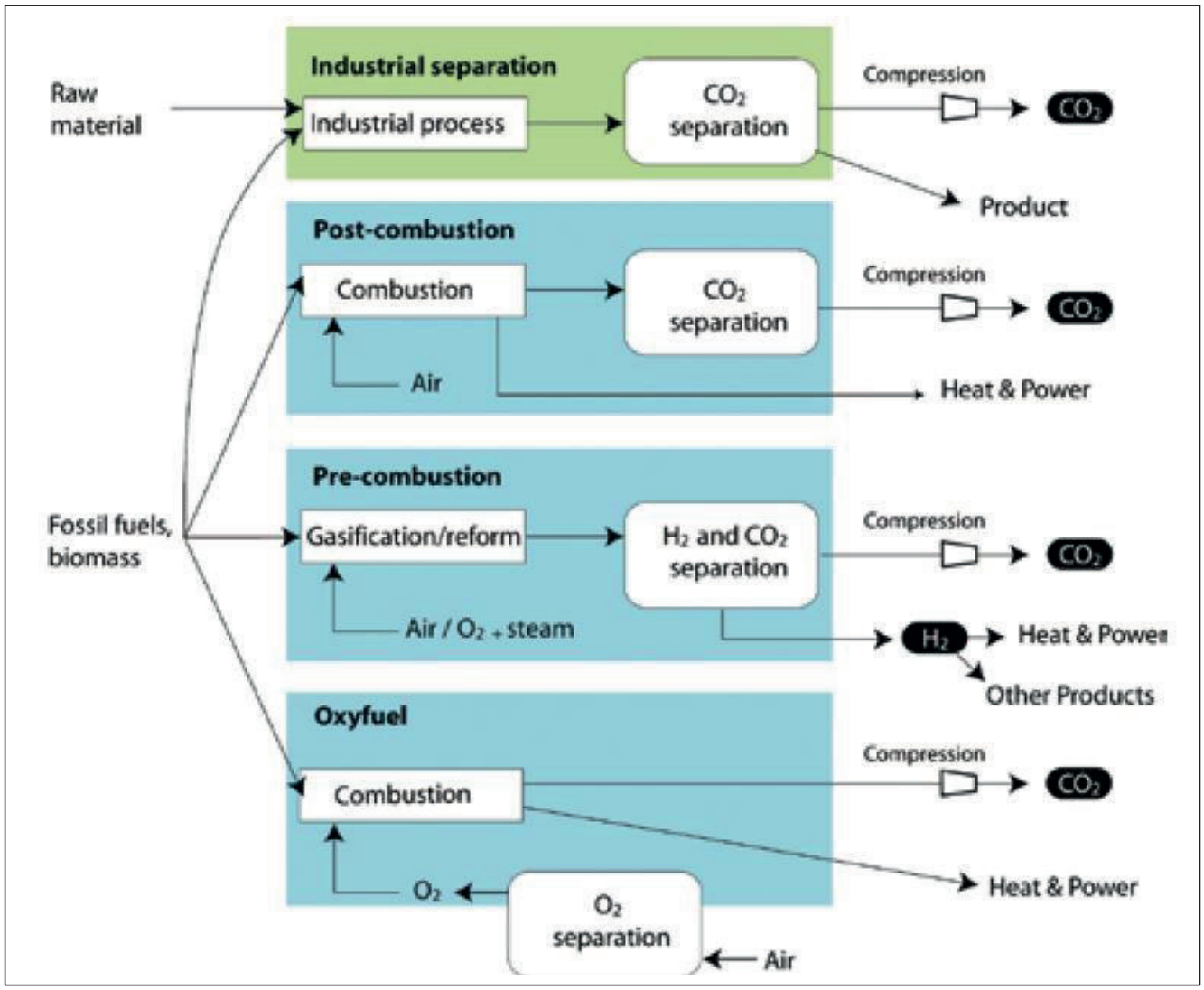


Figure 2: Schematic presentation of carbon capture processes (courtesy CO_2CRC)

CARBON STORAGE

Storing carbon dioxide involves the injection of the captured gas into a deep underground geological reservoir of porous rock overlaid by an impermeable layer of rocks, which seals the reservoir and prevents the upward migration of CO_2 and escape into the atmosphere. Several types of reservoirs are suitable for CO_2 storage, with deep saline formations and depleted oil and gas reservoirs having the largest capacity.

Deep saline formations are porous and permeable rocks saturated with salty brine, widespread in both onshore and offshore sedimentary basins. Depleted oil and gas reservoirs are porous rock formations that have trapped crude oil or gas for millions of years before extraction and can similarly trap injected CO_2. When carbon dioxide is injected into a reservoir, it flows through it, filling the pore space. The gas is usually compressed first to increase density, turning it into a liquid. The reservoir must be at depths greater than 800 metres to retain the CO_2 in a dense liquid state. The CO_2 is permanently trapped in the reservoir through several mechanisms: structural trapping by the seal, solubility trapping in pore space water, residual trapping in individual or groups of pores, and mineral trapping by reacting with the reservoir rocks to form carbonate minerals. The nature and the trapping mechanisms for reliable and effective CO_2 storage, which vary within and across the life of a site depending on geological conditions, are well-understood.

The overall technical storage capacity for storing carbon dioxide underground worldwide is uncertain, particularly for saline aquifers where more site characterisation and exploration are still needed, but potentially very large. Total global storage capacity has been estimated at between 8 000 Gt and 55 000 Gt. Storage availability

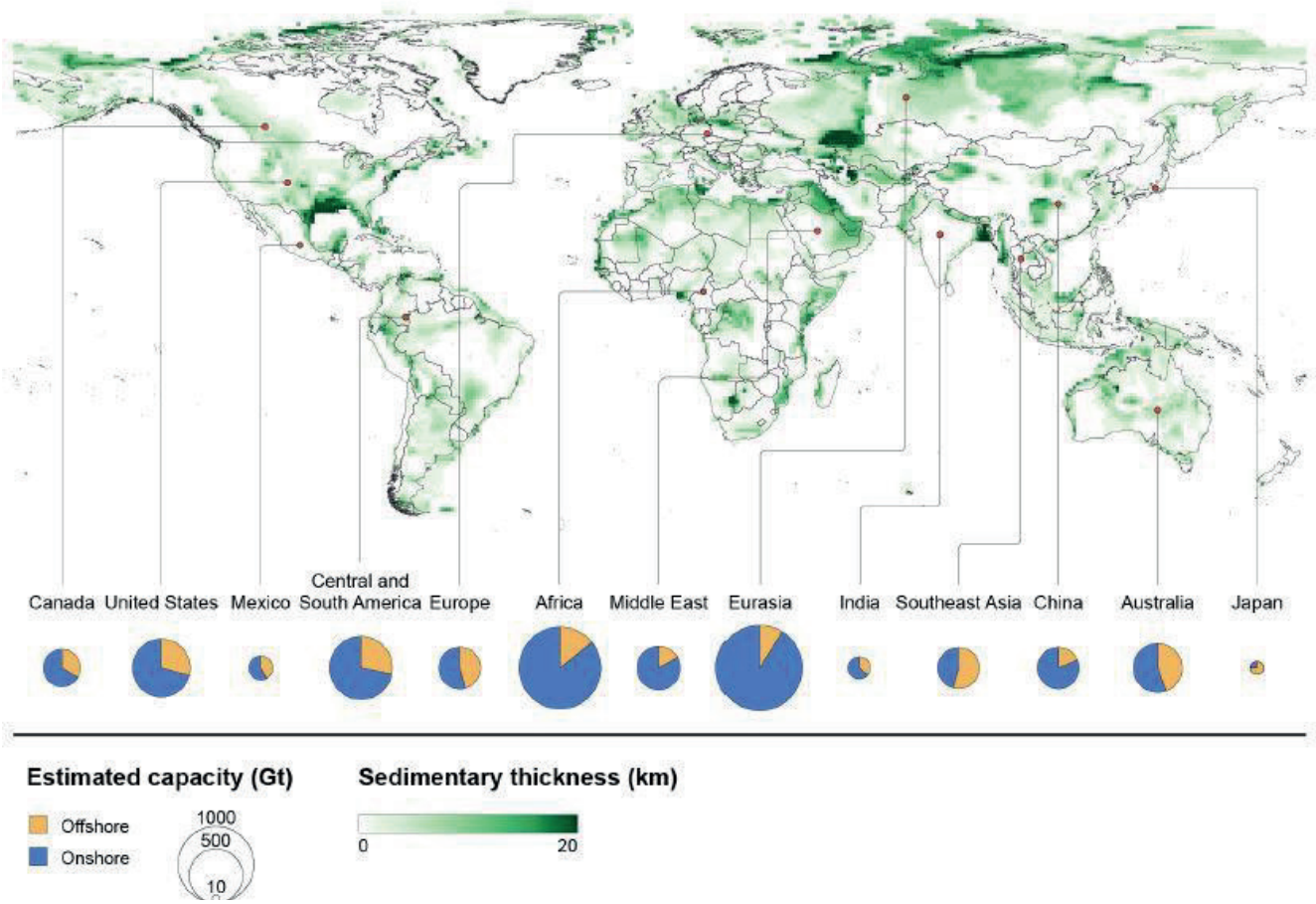


Figure 3: Theoretical CO_2 Storage by Region (courtesy IEA)

differs considerably across regions, with Russia, North America and Africa holding the largest capacities (Figure 3). Substantial capacity is also thought to exist in Australia.

It is apparent from the literature that very little research and investigation have been done on the potential for geological storage of sequestered carbon dioxide in South Africa and the rest of Africa. The existence of coal mines that have reached the end of life could present very attractive solutions for the geological storage of carbon dioxide. More investigation and research are required.

INTEGRATED GASIFICATION COMBINED CYCLE TECHNOLOGY

Integrated gasification combined cycle (IGCC) uses a high-pressure gasifier to turn coal and other carbon-based fuels into pressurised gas *synthesised gas" (syngas). It can then remove impurities from the syngas before the electricity generation cycle. Some pollutants, such as sulphur, can be reusable by-products through the Claus process. This results in lower sulphur dioxide, particulates, mercury, and sometimes carbon dioxide emissions. IGCC plants are better than conventional coal power plants due to their higher thermal efficiency, low non-carbon greenhouse gas emissions, and ability to process low-grade coal. The disadvantages include higher capital and maintenance costs and the amount of CO_2 released without pre-combustion capture. The typical IGCC process is illustrated in Figure 4.

IGCC plants can generate electricity, produce hydrogen, or produce syngas for other applications, such as the production of chemicals or liquid fuels. Some of the benefits of IGCC technology:

- **High efficiency:** They can achieve up to 50% thermal efficiencies, which is significantly higher than that of conventional coal power plants.
- **Low emissions:** IGCC plants can produce significantly lower sulphur dioxide, particulates, and mercury emissions than conventional coal power plants.
- **Flexibility:** IGCC plants can be used to generate electricity from a variety of fuels, including coal, biomass, and waste.
- **Scalability:** IGCC plants can be scaled to meet the needs of various applications.

IGCC technology is a promising option for generating electricity with lower emissions than conventional coal power plants. However, the high capital cost

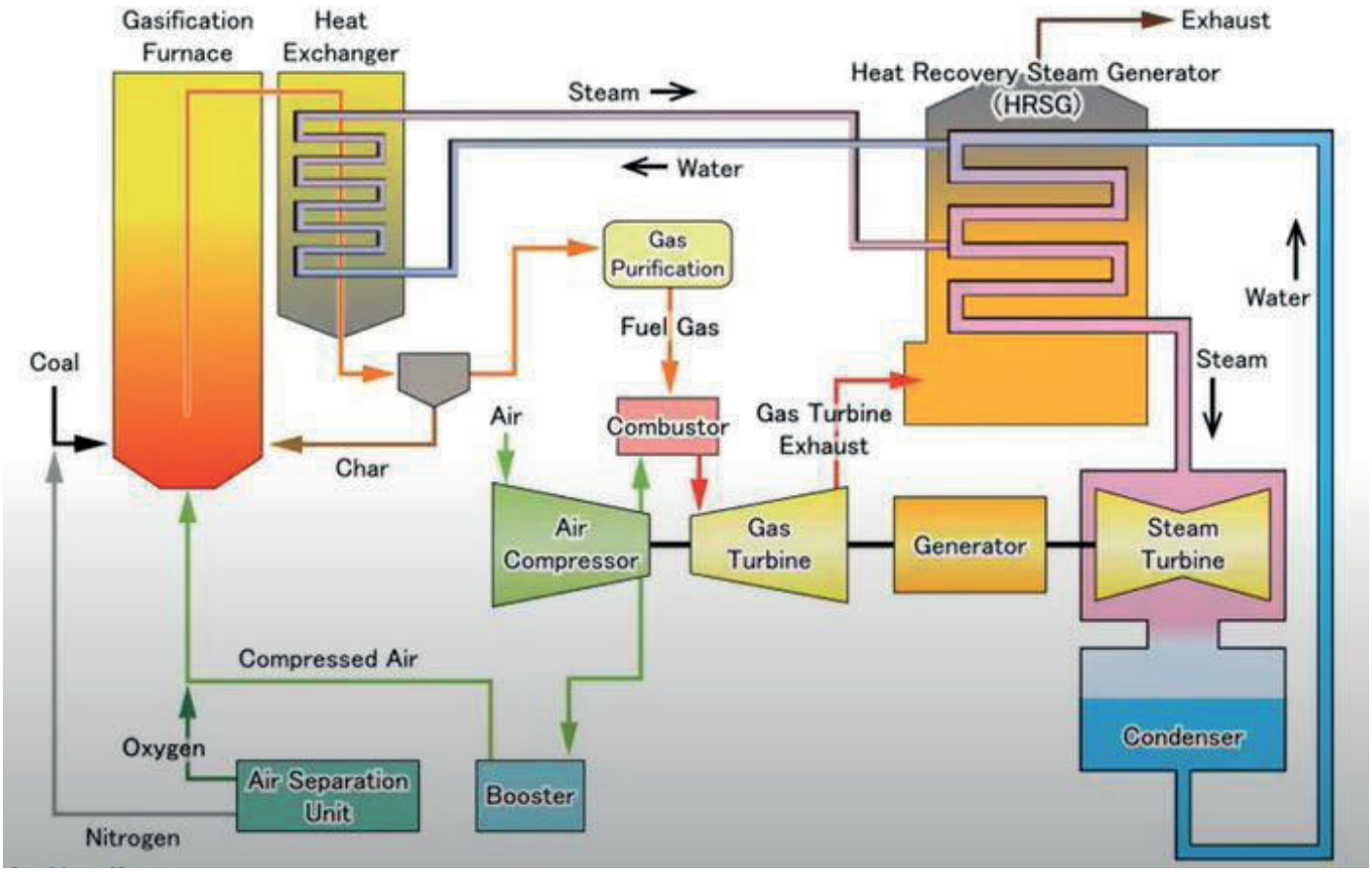


Figure 4: Typical IGCC plant process

and complexity of IGCC plants are challenges that need to be addressed.

THE CASE FOR COAL IN SOUTH AFRICA

There are currently 176 gigawatts (GW) of coal power capacity under construction in 20 countries worldwide. China accounts for 52% of this capacity, followed by India (23%), Indonesia (16%), Vietnam (7%), and Turkey (6%).

Some of these are using clean coal technology (CCT). These technologies are designed to reduce the emissions of pollutants from coal-fired power plants, such as sulphur dioxide, nitrogen oxides, and particulate matter. Some of the clean coal technologies that are being used in new coal power stations include:

- **Flue gas desulfurisation** (FGD), which removes sulphur dioxide from the flue gas of a coal-fired power plant.
- **Selective catalytic reduction** (SCR), which removes nitrogen oxides from the flue gas of a coal-fired power plant.
- **Integrated gasification combined cycle** (IGCC). This technology converts coal into a gas that can be burned in a gas turbine to generate electricity. IGCC plants are more efficient than traditional coal-fired power plants and produce lower emissions.

There are several reasons why countries continue to build new coal power stations. In some cases, it is because they rely on coal for their energy needs and do not have the resources to transition to cleaner energy sources. In other cases, coal is a relatively cheap energy source, and countries are reluctant to give up its economic benefits.

As mentioned, South Africa has around 53 billion tonnes of proven coal reserves, estimated to last for the next 200 years at current production rates.

Coal will continue to play an important role in supplying baseload electrical power to South Africa for the foreseeable future.

South Africa should take consider the following when contemplating our electrical energy requirements during the Just Energy Transition and beyond:

a. We have an abundance of coal. We need to have a very clear understanding of the problem with coal. The problem is that coal, like all other fossil fuels, produces emissions harmful to the environment. The solution to this problem is not necessarily to abandon coal altogether. It is possible to introduce

cleaner coal technologies that would repurpose and greatly improve the capacity and efficiency of existing coal-fired power stations whilst greatly reducing emissions. Such an approach allows for a more managed transition that is in the country's best interests. The current storage options are simply too expensive to provide a baseload on a large scale.

Carbon capture utilisation and storage (CCUS) is a major technology that can be utilised to extend the use of coal. Whilst there has been some talk about this technology, with the CSIR running a micro pilot project, local interest has become non-existent largely because of the overwhelming influence of the anti-coal environmental lobby. This is in stark contrast to some developed countries like Japan. The country is actively developing CCUS despite having less than 1% of South Africa's coal reserves! Japan has set itself a 2030 target for the commercial operation of a coal-fired power station using CCUS technology!

b. The planned decommissioning of Eskom's fleet represents a major loss of generation capacity to the grid. If we go by the Komati Power Station example, only a small fraction of lost baseload generation will be replaced by renewable generation. This will add to the need to strengthen the national grid due to the proliferation of IBR power generation.

   The science and engineering of electrical power generation have vastly improved. A new 100MW steam turbine manufactured today takes less than half the physical space compared to one made 50 years ago. It produces fewer emissions, is more efficient, and requires less fuel to generate the same power. Repurposing a coal-fired power station like Komati with newer, cleaner, and more efficient technology will almost double the power station capacity and provide much-needed baseload electrical power. South Africa needs to rethink the decommissioning and repurposing of Eskom's old coal fleet to utilise clean coal technology to provide cleaner, dispatchable baseload power to the national grid in support of, and not in competition with, the renewable energy initiatives.

c. We have, in Eskom, a world-class power utility with a proven track record (albeit most of it in the past) of running thermal coal power stations. Eskom was compromised by corruption and governance issues. These are being addressed, and there is optimism that the clean-up will be completed soon. I believe the utility should not be burdened with renewable generation in this Eskom clean-up and reorganisation. Eskom should be left to its critical core competency of supplying reliable baseload electricity to the national grid whilst private players compete in the renewable generation space.

d. The obituary for coal in South Africa was written too soon. It would be tragic for the country to turn its back on such an abundant and important energy source. South Africa should be at the forefront of clean coal technology research and development. It is in the country's economic interest to prolong the cleaner use of coal in an increasingly greener world. The country should prioritise clean coal technology R&D by utilising all the intellectual resources. For this, the country should utilise its own financial resources, both public and private, and not be dependent on grants and loans, which come with many conditions.

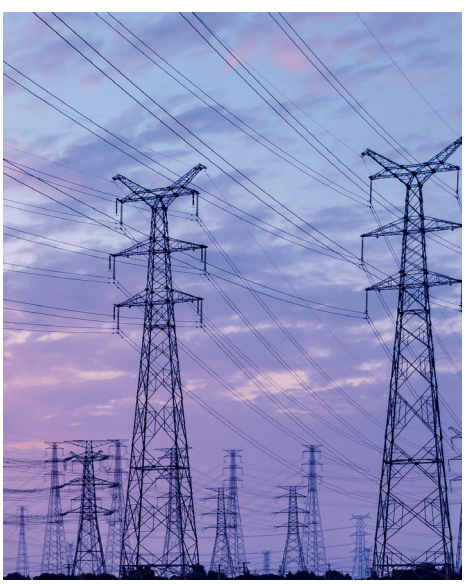
CONCLUSION

As we grapple with the current electricity crisis, South Africa requires solutions that benefit the country both in the short and long term. We must leverage the abundance of coal as a vital resource central to the Just Energy Transition.

The various sectors of the economy must play their part, but Government and Eskom must play a decisive and leading role. Global concerns must be considered, but not to the detriment of our people and economic interests. South Africa is uniquely positioned in Africa with abundant natural resources, world-class academic institutions, a relatively youthful population, and fairly sophisticated financial markets.

Furthermore, we have the continent's most advanced and developed industrial and manufacturing base, which we have sadly neglected over the last few decades. As we look to tackle the current electricity challenges, there is a unique opportunity to revitalise industry and create much-needed employment by harnessing all our abundant human, natural, and financial resources.

However, for this to be realised, decisive and visionary leadership is required at all levels of the public and private sectors. wn



How the channel can help unlock the digitally connected universe of tomorrow

Digitally enabled, connected environments have become commonplace, with many customer interactions occurring in the digital realm. Technology drives innovation, such as remote asset monitoring, tracking and maintenance.

By Ahmed El-Besary
Vice President, Channel Sales & Marketing. Anglophone Africa, MEA at Schneider Electric

However, these innovations are impossible without edge functionality and distributed IT environments. And edge and distributed IT cannot function without resilient and reliable energy and connectivity.

To ensure companies maximise their edge deployment strategies, they must treat operations and cloud infrastructure as one unified strategy rather than separate items. IT innovation and operational efficiency become symbiotic, measured, and managed together.

The goal of a unified strategy and the cornerstone of digitally enabled, connected environments is seamless access to IT services, regardless of whether those services reside at the edge, in the cloud or a data centre.

However, distributed IT environments are especially vulnerable to disruptions threatening technology availability. Poor connectivity and maintenance delays are just some challenges facing distributed IT environments.

The reality is organisations that wish to complete the mindset shift to unified operations and IT must monitor every facet of their infrastructure and its impact on operations.

HOW PARTNER ECOSYSTEM CAN HELP

The channel has tremendous opportunities to assist organisations in establishing and maintaining unified operations.

Not all organisations can manage every nuance of merging technology and operations. Building an ecosystem of partners will be paramount to success. These partners encompass the entire channel, from distributors to integrators and consultants, who provide skills and knowledge a company's workforce may not possess.

Companies gain connections to specific services rendered and a wider breadth of knowledge and access to expertise and innovative technologies by working with experts. Moreover, leveraging partners to fill knowledge gaps can help stakeholders build internal alignment that drives change.

TECHNOLOGY PARTNERS SPEED THE TRANSFORMATIVE JOURNEY TO A DIGITALLY ENABLED FUTURE

As digital customer interactions evolve and proliferate, transforming into digitally enabled, connected operations becomes a question of "when", not "if." This transformation can confer numerous benefits, such as:

- Improved efficiencies.
- Reduced risk.
- Enhanced security posture.
- Sustainable operations.

Investments in the right technology and strong partner relationships can ease the burden and accelerate transformation, unlocking new potential and competitive advantages.

At Schneider Electric, we recently launched the Edge Software & Digital Services Programme to help providers quickly establish managed power services while offering flexibility in implementation, lifecycle rebates, and a complete step-by-step resource, The Essential Guide to Growing your Business with Managed Power Services."

Partners can also join the mySchneider IT Solutions Partner Programme here. wn

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04/07/2023	New Engineering Contract (NEC)
04/07/2023	Photovoltaic Solar Systems
05/07/2023	Design Thinking and Innovation for Engineering Professional
06/07/2023	SAIEE Boimedical Chapter launch
11/07/2023	Fundamentals of Power Distribution
12/07/2023	Select, Maintain & operate your Rotating Electrical Machines like a Pro
18/07/2023	Planning Strategic Feasibility Studies
18/07/2023	Finance Essentials for Engineers
18/07/2023	Photovoltaic Solar Systems (East London)
19/02/2023	Women in Engineering: finding your path to a new engineering career
19/07/2023	Partial Discharge Detection and Measurement
20/07/2023	Photovoltaic Solar Systems (Port Elizabeth)
26/07/2023	Nuclear Chapter presents: Real Nuclear Costing Options For RSA
26/07/2023	Blockchain and Money

AUGUST 2023

02/08/2023	Operating Regulations For HV/MV Systems - ORHVS
02/08/2023	Construction Regulations from a Legal Perspective
03/08/2023	Incident Investigation & Root Cause Analysis
15/08/2023	Hack Lab
15/08/2023	LV/MV/HV Switch Gear Operation, Safety, Maintenance and Management
16/08/2023	Fundamentals of Medium Voltage Protection
16/08/2023	ECC Short Talk: Introduction to the Xe-100 Pebble Bed Reactor to Support Grid Stability
17/08/2023	SANS 10142-1 -Edition 3
22/08/2023	Introduction to Artificial Intelligence for Professionals
24/08/2023	Fundamentals of Practical Lighting Design for Commercial
29/08/2023	Project Management for Engineers
29/08/2023	Arc Flash

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