



CENTRE FOR RENEWABLE &
SUSTAINABLE ENERGY STUDIES



Stellenbosch

UNIVERSITY
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CRSES ANNUAL REPORT 2023



science & innovation

Department:
Science and Innovation
REPUBLIC OF SOUTH AFRICA





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FOREWORD

The Centre for Renewable and Sustainable Energy Studies (CRSES) at Stellenbosch University was established in 2007 as the National Hub of the Postgraduate Programme in Renewable and Sustainable Energy Studies. The Centre acts as a central point of entry into Stellenbosch University for the general field of renewable energy, and our research focus areas include solar, thermal and photovoltaic systems, and wind, geothermal and bioenergy. In recent years we have expanded the scope to include power system simulation and the green hydrogen economy. Our programmes range from initial feasibility studies for the deployment of renewable energy to highly technical studies on specific renewable energy technologies and the power grid. In this respect, innovation and building human capital in the field are seen as two of the main contributions made by the Centre. We have also significantly increased the number of short courses, with new offerings in power grid modelling and simulation, and green hydrogen.

This is the 18th Annual Report of the Centre and spans the period 1 January to 31 December 2023. It presents an overview of our activities as we look back on 2023 as a year of transition in leadership, with Prof Cristina Trois taking over as the new director in October after the departure of Prof Samson Mamphweli, who joined SANEDI (the South African National Energy Development Institute). Despite this, we were able to meet and exceed the targets set by various stakeholders because of bright, motivated students and hard-working, well-qualified staff. To them, I express my sincere appreciation and gratitude, because an organisation can only reach and exceed its goals with motivated people.

In 2023, the Centre completed its 17th academic year and we can look back on a time during which four postgraduate students graduated, 18 postgraduate modules and short courses were presented, and 35 peer-reviewed journal papers and 18 conference papers were produced.

The main assets of the Centre remain the excellent staff, both those employed by the Centre as well as other academics and researchers associated with the Centre, the excellent facilities at

Stellenbosch University, and the dedicated staff and students at the other spokes associated with the Centre. A truly remarkable accomplishment was that the Centre has established itself as the best-known research centre in renewable energy, is based at a university in South Africa, and is also internationally acknowledged as a centre of excellence in certain renewable energy disciplines.

We look forward to an even more exciting 2024, which will include a number of changes at the Centre as the new Director charts a new course for the next decade. We trust that you will find this report interesting and inspiring to read.

Prof JL van Niekerk
Acting Director



WELCOME TO THE NEW DIRECTOR

Prof Christina Trois

"I am extremely honoured to serve as Director of the Centre for Renewable and Sustainable Energy Studies at Stellenbosch University. Working alongside our partners and collaborators, we will continue contributing to the development of critically needed skills, technology innovation, and cutting-edge research in support of the Just Energy and Decarbonisation Transition of our country and the African continent," says a very enthusiastic Prof Cristina Trois, appointed as the CRSES's new Director. We wish her well with her first five-year tenure!



BUILDING HUMAN CAPITAL

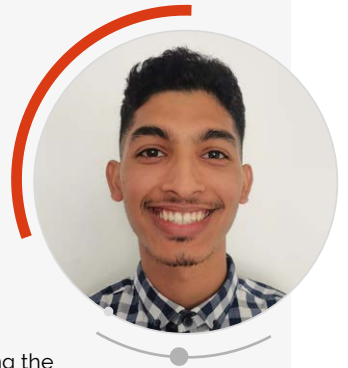
CRSES contributes to Human Capital Development through several capacity building pathways including internships, academic programmes, training as well as continued professional development (CPD). The aim is to provide highly skilled scientists, engineers and academics, as well as further capacitate professionals already in industry.

Meet our interns

Jiyaad Anthony

Since commencing my internship at the Centre for Renewable and Sustainable Energy Studies (CRSES) on 3 July 2023, I have been actively engaged in various projects that have enriched my experience in the field of renewable and sustainable energies. Currently in the third and final year of my mechatronic engineering studies at CPUT, my responsibilities at CRSES encompass a range of tasks. These include curating and organising research papers for the Jiyaad Anthony literature review project, autonomously managing the demonstration unit project, and fulfilling diverse assignments allocated by my line manager. Notably, these tasks involve battery simulations and 3D modelling sites for photovoltaic studies. Amidst these responsibilities, I find solace in the camaraderie within the team and the delightful moments, such as enjoying a good cup of coffee. The work environment, particularly during light-hearted moments with Don and Prof Bernard, is both enjoyable and intellectually stimulating. The exposure to various projects, including the VnA PV and BESS study and the Just Energy Transition literature review project, has been instrumental in broadening my understanding of renewable energy.

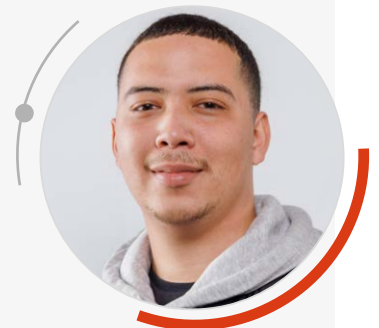
My internship experience has proven to be a valuable learning ground, providing me with not only technical skills, but also insights into effective communication and office etiquette. Participating in projects like the VnA PV and BESS study equipped me with practical knowledge of finance within the renewable energy sector, while the literature review project honed my research skills. Beyond technical expertise, the CRSES work environment has been instrumental in fostering personal growth. I've learned to communicate effectively and to conduct myself in an office setting, addressing a previous area in need of improvement.



Mika-eel Dollie

My time at the Centre for Renewable and Sustainable Energy Studies (CRSES) has been a significant learning experience, offering valuable insights and expanding my knowledge in the field. Engaging with the technical designs for the Alan Gray and Waterfront Pre-feasibility studies, as well as contributing to the pre-feasibility report for the V&A Waterfront, were particularly noteworthy moments. These experiences allowed me to apply theoretical knowledge to practical scenarios and improved my technical and analytical skills.

Working alongside the experienced engineers at CRSES was instrumental in gaining practical insights that complemented my academic learning, shaping me into a more knowledgeable professional with a keen interest in renewable and sustainable energy. The internship started on 3 July 2023 and ends on 31 December 2024.



Farewell to a key role player

Ms Karin Kritzinger joins Agora Energiewende

Karin Kritzinger's time with CRSES came to an end in July 2023 after she accepted a position at Agora Energiewende as project lead: power international at their Berlin office.

Throughout her ten years at CRSES she led numerous consulting and research projects focusing on a wide range of renewable energy technologies and their integration into local and national grids. These projects involved working with international partners, development agencies, universities, and national and international utility companies.

Some noteworthy recent programmes and projects in which she played a leading role include:

- The SOLTRAIN project (www.soltrain.org)
- The Eskom Power Plant Engineering Institute
- Various research projects funded by the WWF-Nedbank Green Trust, focusing on collaborations with South African municipalities

Prior to her departure, Karin served as a key member of the CRSES management team, overseeing consulting and research contracts. She also led the energy section of the Fraunhofer Innovation Platform for the Water Energy Food Nexus at Stellenbosch University, a collaborative initiative between Stellenbosch University and Fraunhofer-Gesellschaft, Europe's largest applied research organisation (www.fip.sun.ac.za).



DSI HUB and SPOKES

On 11 September 2023, the Annual Hub and Spokes Strategic Session took place at STIAS in Stellenbosch. The strategic session was attended by all the relevant role players. The event was used to reflect on the past year and to develop strategic goals to be achieved in 2024.

Strategic session 11 September 2023



Attendees of the Hub and Spokes Strategic Session

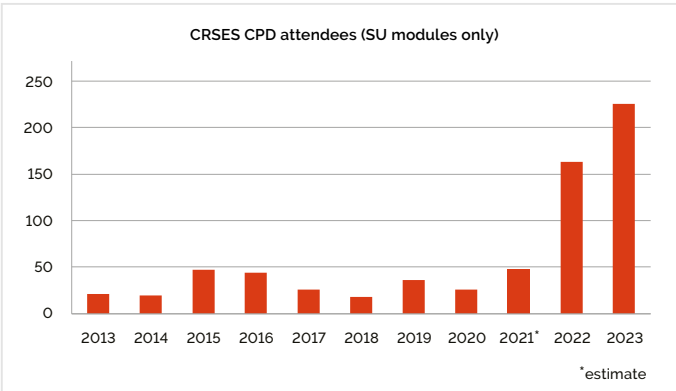
Short courses

In 2023, the Centre for Renewable and Sustainable Energy Studies (CRSES) offered a total of 17 short courses, with 16 of them hosted by Stellenbosch University (SU) and one short course hosted by our partner university, the University of Cape Town (UCT). The courses were presented from March through to September 2023, with each course lasting five days. Municipal employees and industry Continuing Professional Development (CPD) certificate attendees were overall the highest in attendance for the courses. The short courses also form part of the academic programme of postgraduate students, with selected courses being compulsory for structured Master's and postgraduate diploma students at SU.

There was an impressive increase in CPD attendees recorded in 2022 and 2023, with a total of 163 and 226 attendees respectively. This growth can be attributed primarily to a grant received by the Centre from the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). GIZ funding subsidised attendance by employees of state-owned enterprises (SOEs) and municipalities. CRSES also received some funding from the Energy and Water Sector Education Training Authority (EWSETA).

CRSES hopes to continue to secure grants of this nature to be able to ensure further subsidised attendance of the short courses presented in the coming years.

The graph below indicates the growth in the number of CPD attendees of our SU modules over the last 11 years, with impressive growth being reflected in 2023.



Full module name	Total	Academic Students	Eskom CPD certificate attendees	Municipality and industry CPD certificate attendees
Smart Grid Technology Overview	22	20	0	2
Power System Operations	21	8	7	6
Power System Flexible Operations (UCT)	17	0	14	3
Renewable Energy Systems	24	23	0	1
Solar Thermal Energy Systems	25	19	0	6
Green Hydrogen Project Engineering	15	0	11	4
Hydrogen in the Energy System	23	0	12	11
Green Hydrogen Technology	19	2	6	11
Green Hydrogen Project Engineering	29	4	7	18
Distribution Customer Concepts	23	10	9	4
Power System Data Analytics	31	6	21	4
Bioenergy	20	19	0	1
Wind Energy	15	12	0	3
Advanced Photovoltaic Systems	53	21	0	32
Long-term Power System Planning	26	6	3	17
Hydro and Ocean Energy	14	14	0	0
Smart Grid Communication	10	10	0	0
Energy Storage Systems	40	27	0	13
Total attendees in 2023	427	201	90	136

Awards and prizes

South African National Energy Development Institute (SANEDI),
21-22 November 2023

SANEDI hosted its first annual conference at Emperors Palace, marking a significant milestone in the field of energy development and sustainability in South Africa. The conference served as a platform for stakeholders to convene, collaborate and discuss innovative strategies for addressing the country's energy challenges.

Theme and focus

The conference focused on the theme of "Inform and Increase Awareness on Energy Solutions Showcasing Government Initiatives in the Energy Sector". It aimed to answer questions and unpack issues around the country's current energy crisis and its prospects for a more stable and sustainable energy future. These included contributing to sustainable energy solutions, building energy expertise and competence, creating a capacitated, effective, efficient and sustainable operational environment, and increasing awareness of sustainable energy.

The principal objective of the conference was to engage robustly and address pivotal matters in the energy sector. The conference showcased the initiatives and projects presently being undertaken by SANEDI and others to advance energy development for our nation.

Keynote speakers and presentations.

The programme featured a keynote address by energy expert Prof Prathaban Moodley on "Cleaner Fossil Fuels" and their impact on South Africa's Just Energy Transition. Further topics included Energy Efficiency (EE) project knowledge, such as the EE Standards and Labelling Project and its benefits for all South Africans.

Both days of the conference included panel discussions on, among other topics, the Just Energy Transition, demand-side management, and funding mechanisms for energy research. Further energy best practices and issues were addressed by various speakers, including South Africa's hydrogen roadmap, smart grids, and the role of data and knowledge management in improving the energy efficiency of buildings.

PV Insight, a spinout of the PV Spoke at NMU, won the entrepreneur award at SANEDI's First Annual Energy Conference.

Prize winners 2023:

The prize winners for 2023 are as follows:

Best Final-year Project in Renewable Energy

Ryno Gerber - 93%

Two-speed wind generator; Supervisor: Prof M Kamper

Best Postgraduate Project in Renewable Energy

Annita Attieh - 80%

Techno-Economic Assessment of Electricity Generation from a 10 MW Medium-Scale CSP Plant Using a Steam Turbine; Supervisors: Prof C McGregor & Dr Hannes Pretorius

Graduation list

Graduandi: March 2024

Name	Programme
Mr P Olivier	Meng (Research)
Mr RP Roodt	MSc
Mr LC Snyman	MEng (Research)

Graduandi: December 2023

Name	Programme
Mr EB Hassan	PhD



From the left: Prof Sampson Mampheli (SANEDI), Somila Xosa (DSI), Prof Ernst van Dyk (NMU)

RENEWABLE ENERGY RESEARCH AND MARKET TRANSFORMATION PROJECTS

CRSES aims to facilitate the transformation of the energy sector by moving away from fossil fuel-based energies to renewable energy-based systems.

The contribution of Power-to-X (PtX) in enabling the long-term carbon-neutral transformation of South Africa's energy system

Various national strategies have emphasised that green hydrogen-based sustainable molecules and fuels will be crucial to reach climate neutrality, with indispensable applications in power systems. This lies particularly in increasing penetration of variable renewable energy sources (RES), also in the industry and transport (long-haul aviation and shipping) sectors. Recent South African energy scenario studies have focused on the ten-year horizon to 2030/2032, motivated by the energy crisis and the need to plan investments in the short term (Integrated Resource Plan (IRP), Transmission Development Plan (TDP), Just Energy Transition Investment Plan (JET-IP), etc). Nonetheless, analyses are required to assess options for the implementation of South Africa's Nationally Determined Contribution (NDC) and low-emissions development strategy (which would result in an ambitious outcome of 350 to 375 Mt CO₂eq in 2030, with net zero by 2050) to assess the level of support required within the context of existing policies and measures.

This project, which is taking place in collaboration with Fraunhofer IEE and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), along with partners at Agora Energiewende, Meridian Economics, the Council for Scientific and Industrial

Research (CSIR) and the University of Cape Town, aims to facilitate the evolution of the existing power system until 2050 to achieve decarbonisation targets and defossilisation, while simultaneously prioritising PtX integration for domestic use and export. Particular attention will be given to the limitations of the short-term 2030 horizon to understand how long-term commitments (2050) translate into short- and mid-term priorities. Consideration will also be given to off-grid solutions, as well as an assessment of RES that can be integrated into the power system via the benefits of sector coupling and storage to successfully implement PtX applications in the country.

Comprehensive modelling of the South African energy system is required, capturing its interaction with both electricity and molecule demand with a high spatial and temporal resolution. As a result, developing a versatile, sector-coupled, open-source capacity expansion optimisation model explicitly tailored for South Africa's needs forms a central feature of this project. The focus will be on the cost-efficient achievement of defossilisation targets by integrating renewable energies into techno-economically optimised scenarios, highlighting how and where direct electrification, green hydrogen and PtX fuels can contribute to carbon neutrality. The developed energy transition pathways/ scenarios will be leveraged to inform ongoing and upcoming policy and expert discussions on this topic, exploring uncertainties and identifying key enablers for a cost-efficient transformation.

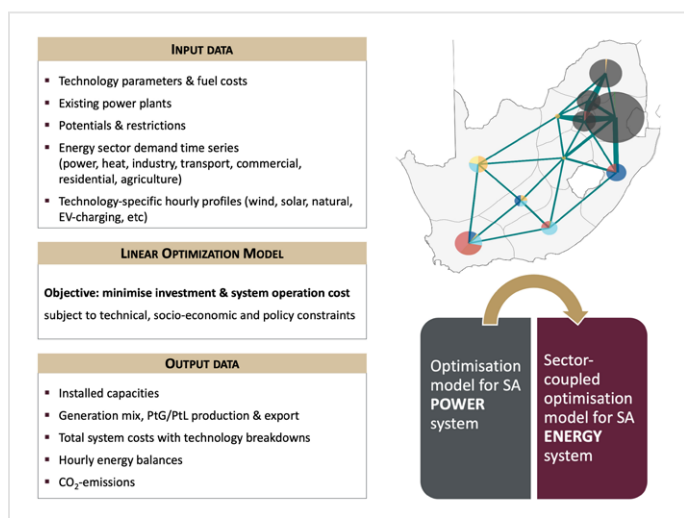


Figure 1: Open-source optimisation model of the South African energy system



Figure 2: Project collaborators

NSTF webinar: Transitions in South Africa's energy provision, 22 August 2023

Prof Bernard Bekker, Sarchi Chair in Power System Simulation within the Department of Electrical & Electronic Engineering, was a keynote speaker at the webinar hosted by the National Science and Technology Forum (NSTF) in August 2023. The title of his presentation was, "Integration of renewable sources into the South African electricity system: Opportunities and risks".

Prof Bekker's presentation had the following key messages:

1) Municipal financial viability cannot ignore the prosumer business case

Municipal financial viability is impacted by the rapid increase in embedded generation. Responsive prosumer tariffs are required to manage this. However, in designing these tariffs, their impact on the

prosumer's business case cannot be ignored: it risks negating the potential value added by embedded generation, and encouraging illegal connections and grid defection.

2) Hosting capacity is a key constraint

More research is required to understand grid infrastructure bottlenecks, and how to optimise the use of existing infrastructure. Improved visibility and control of renewable energy inverters on the distribution network should be an objective of any future embedded generation regulations.

3) System flexibility is South Africa's next challenge

Although hosting capacity is a barrier to the widespread integration of renewable source, system flexibility should also be a focus of South Africa's future power system planning.

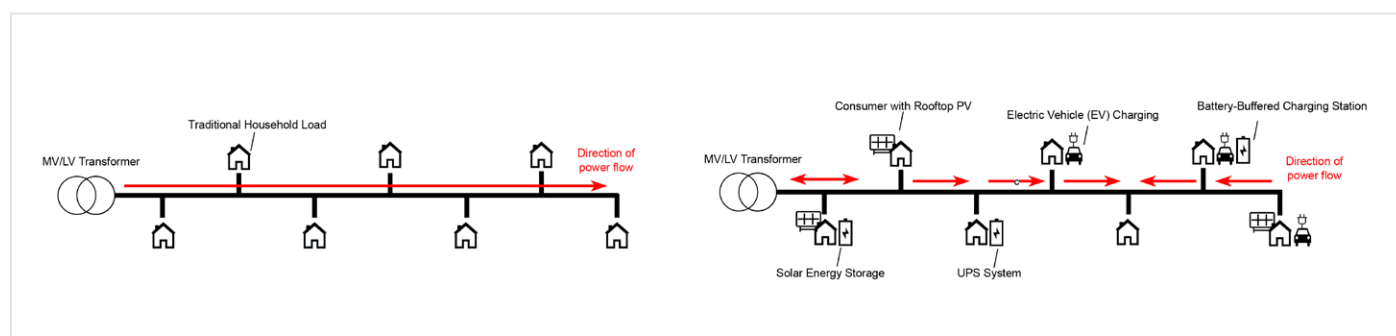


Figure 3: A paradigm shift from a central to a distributed system

PRESENTATION TITLE:

*"Integration of
renewable sources
into the South African
electricity system:
Opportunities
and risks"*

RENEWABLE ENERGY RESEARCH AND MARKET TRANSFORMATION PROJECTS continued

Transmission Financing Seminar, 21 September 2023

The Minister in the Presidency for Electricity, Dr Kgosientsho Ramokgopa, co-hosted the SA Transmission Financing Seminar with the Johannesburg Stock Exchange (JSE) on 21 September 2023.

Experts, including Ms Monique le Roux from the CRSES, delivered presentations at the seminar. In addition, stakeholders from the energy and financial sectors shared their insights into the financing and development of South Africa's electricity transmission infrastructure for sustainable energy security in the country.



Kgosientsho Ramokgopa, minister of electricity

ESKOM National Planners Conference, 15-16 November 2023

The Eskom Cape Coastal Cluster Department hosted the Annual National Planners Conference from 15 to 16 November 2023 at their Brackenfell offices. Mrs Monique le Roux from CRSES delivered a presentation on the "Electric Vehicle Grid Impacts and Hosting Capacity of Distribution Networks". The National Planners Conference was attended by various stakeholders, and Eskom, government departments and industry used the opportunity to showcase their latest innovations in network and grid planning.

2023 IEEE (Institute of Electrical and Electronics Engineers) PES & IAS Power Africa Conference, 6-10 November 2023

The 2023 IEEE PES & IAS Power Africa Conference took place in Marrakech, Morocco from 6 to 10 November 2023. At the conference, Mr Don Fitzgerald presented a paper co-authored by Prof Bernard Bekker. The title of the paper was "Open Data Quality Assessment Behaviour and a Boomerang Effect Investigation using the SAURAN Weather Station Network".

The paper investigated the importance of accessible high-quality weather data in enabling renewable energy and climate-based research in Africa, and across the world. Caution must be extended to open datasets with respect to data quality, as unchecked, poor-quality data produces poor results.

The paper furthermore investigated the data quality assessment behaviour of researchers who have used data acquired from the South African Universities Radiometric Network (SAURAN). This was done by performing a review of related published literature over the last eight years. A review was also done of international open-weather data platforms to establish the best practices worldwide.

The results showed that, although SAURAN data quality is variable over time, only 25% of publications in the last eight years mention quality checking the data used. A case study was then done by reviewing a 2022 publication that made direct use of poor-quality SAURAN data to produce poor-quality results and conclusions.

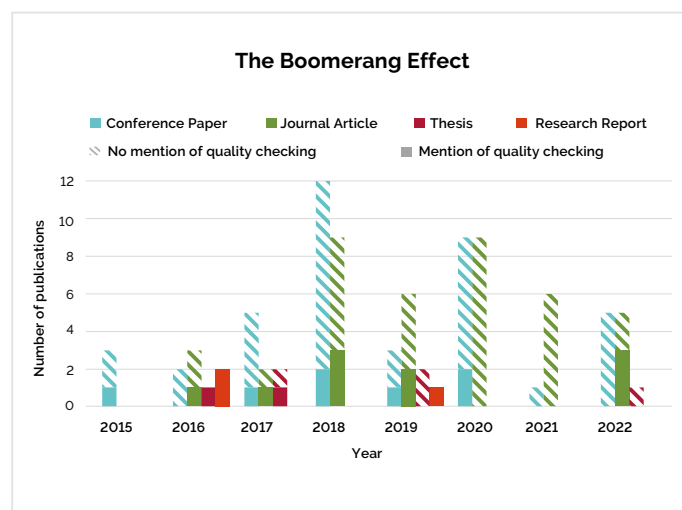
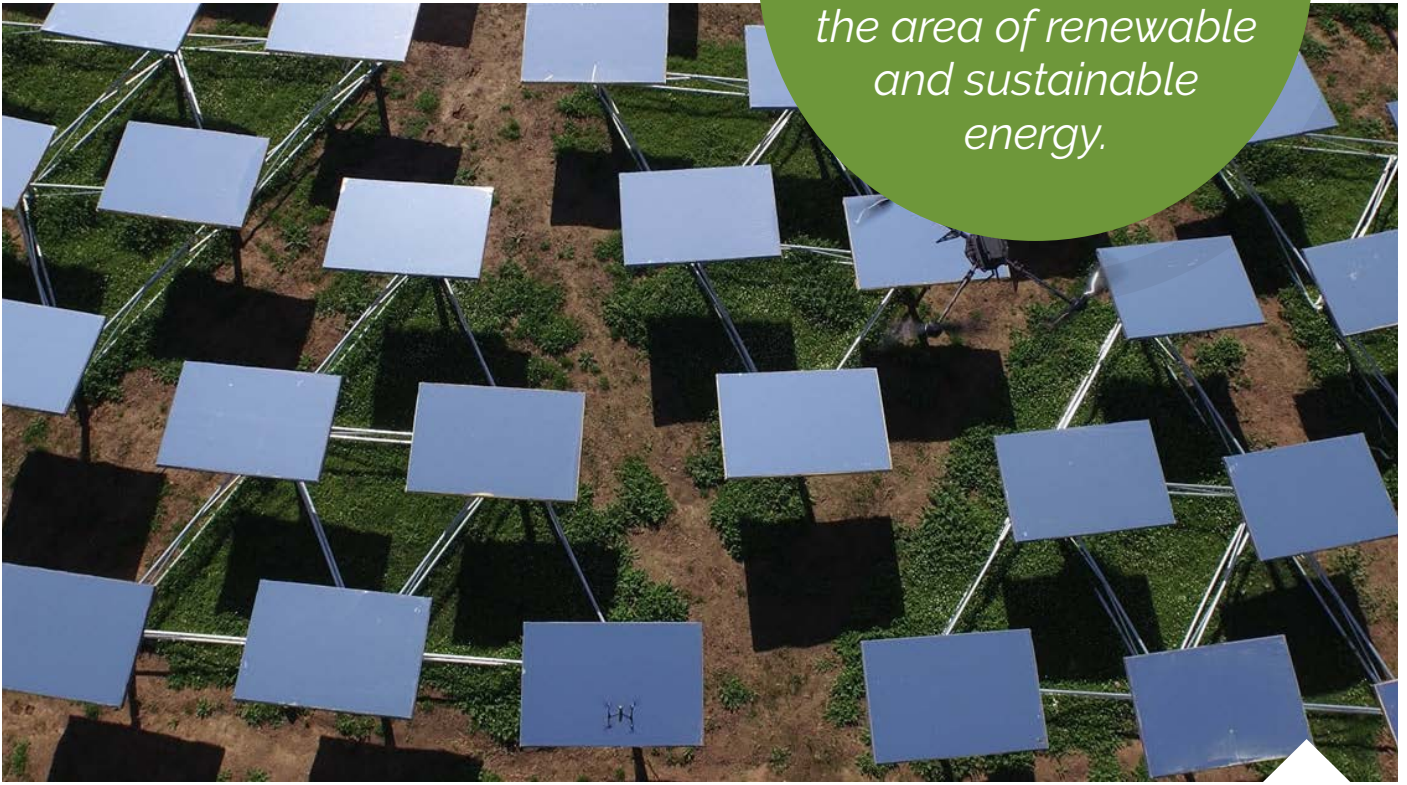


Figure 4: SAURAN data quality assessment behaviour of researchers by year and publication type, categorized by if the publication made any mention of quality checking

Technologies

Stellenbosch University has successfully licensed the HelioPod patent and family patents, which include some know-how, technical material, and the basic software of the CSP technologies in the STERG Portfolio to a company based in the United Kingdom. It is a non-exclusive licence, and the licensee will be paying an upfront licensing fee and thereafter a royalty on the commercial income from the licensed technologies.

It is very positive to see local technology making an international impact, specifically in the area of renewable and sustainable energy.



Drone over Helio100



Helio100

AWARENESS AND OUTREACH

Ministry Launches Off-the-Grid Media Lab at Moloke Primary School

A special project has been completed by the Department of Higher Education and Training, in collaboration with the Department of Science and Innovation and Stellenbosch University's Centre for Renewable and Sustainable Energy Studies.

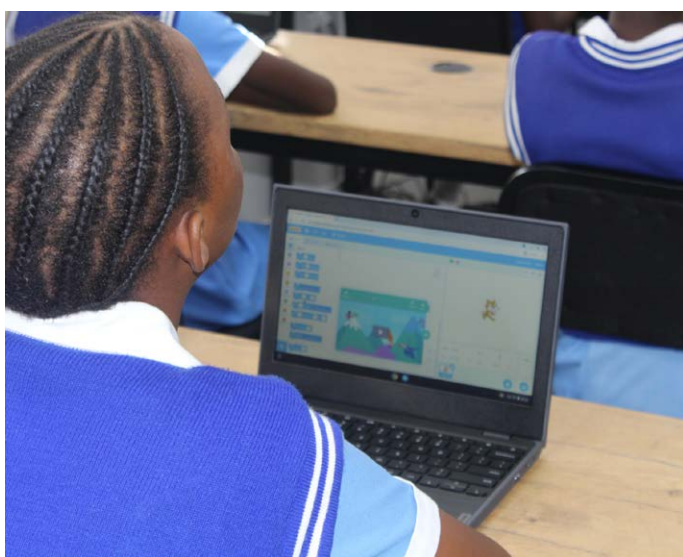
The media lab, officially handed over on 24 March 2023, aims to bridge the gap in access to knowledge, especially in rural areas. Powered by solar energy, the lab will serve not only Moloke Primary School, but also the nearby community colleges and higher schools.

The goal of the project is to make knowledge more accessible while ensuring sustainability. All the solar panels, inverters and

batteries used were manufactured locally. To address security concerns, the lab was equipped with robust features including security cameras, infrared sensors, and alarms.

This initiative is expected to revolutionise teaching methods in the area in alignment with the fourth industrial revolution. With Clevertouch interactive displays and Chromebooks, students can learn in new ways, accessing educational materials and collaborating with other schools.

Teachers will benefit from software facilitating teaching processes, with access to educational apps and pre-created lessons. This advancement signifies a significant step towards fostering a passion for learning and enhancing education in underprivileged areas.



Children receiving class in the new Media Lab



Minister Ndimande visiting the CRSES exhibition at the official launch of the Media Lab in Moloke.

Updates on the Masia Water-Energy-Food (WEF) Nexus Sustainable Project

Funded by the Department of Science and Innovation, the Masia Water-Energy-Food (WEF) Nexus project is a collaborative effort aimed at addressing sustainability challenges and improving. It has made significant progress since its inception.

Infrastructure upgrades

We have been hard at work installing key infrastructure to support our initiative. This includes setting up a solar PV energy system to power our operations sustainably. We have also ensured a reliable water supply for both agriculture and daily use. To promote farming, we have built shades for fruit trees and vegetables and set up a sprouting space to help seeds grow.

Training of interns

Training programmes for interns in agricultural production have been ongoing. We believe in empowering local community members with the skills they need to contribute to sustainable farming practices to improve their livelihoods.

Sweet success with sweet potatoes

In 2023, we celebrated a major milestone: our first sweet potato crop was grown, harvested and sold to the public. It is exciting to see our hard work paying off and to know that we are having a positive influence on food security and income generation in our community.

Expansion of fruit nursery and vegetable planting

We have also been busy planting the seeds for our first fruit nursery and for various vegetable varieties. This planting season, which began in December 2023, is ongoing, and we are excited to see our crops flourish and contribute to local nutrition and food diversity.

Deployment of H₂ fuel cell

As part of efforts to explore innovative energy solutions, a 5 kW H₂ fuel cell was deployed as a clean energy alternative. While we have made progress, we are still waiting on the completion of an electrolyser by NWU to maximise its potential.

Looking ahead

As we continue to make improvements in the Masia WEF nexus project, we are filled with optimism for the future. With the right infrastructure in place, ongoing training efforts, successful crop cultivation and clean energy initiatives, we are well positioned to achieve our goals of sustainability and community empowerment.

The progress we have made thus far is testament to the dedication and hard work of everyone involved. Together, we are proving that sustainable practices can make a real difference in people's lives. We are committed to building on our achievements and creating a brighter, greener future for Masia and beyond.

Below is a list of the project partners and their respective roles:

Partner	Role
Department of Science and Innovation (DSI)	Funding and project support
South African National Development Institute (SANEDI)	Overall view of the project
DSI's Centre for Renewable and Sustainable Energy Studies (CRSES) at Stellenbosch University	Research, co-ordination of stakeholder engagement
Agricultural Research Council (ARC)	Research, deployment of agriculture infrastructure and training
Masia Traditional Authority	Implementation site and project support
Bambili Advisory	H2 fuel cell installation and training
University of Pretoria	Deployment of the Brayton cycle
University of Venda (UniVen)	Stakeholder engagement
National Youth Development Agency (NYDA)	Youth business development



Masia Village Water-Energy-Food Nexus technology, and nursery images

AWARENESS AND OUTREACH *continued*

Southern African Sustainable Energy Conference (SASEC 2023)

The 8th Southern African Sustainable Energy Conference (SASEC) Embraces Innovation and Collaboration

The 8th Southern African Sustainable Energy Conference (SASEC) was held from 15 to 17 November 2023 at the picturesque Boardwalk Hotel in the Eastern Cape province. This year's event was hosted by Nelson Mandela University and chaired by Prof Ernest van Dyk.

SASEC is renowned as a top platform for researchers, engineers, technologists and enthusiasts to explore the latest advances in sustainable energy. It also provides an important opportunity for postgraduate students to showcase their research and make industry connections. Academic papers covered a wide range of topics, including solar thermal and PV energy systems, wind energy systems, hydrogen, hydro- and ocean energy, renewable energy resource assessment, demand-side and energy storage applications, power systems planning and operations, and bioenergy.

The 2023 conference was a significant milestone for SASEC, focusing on various cutting-edge topics shaping the future of sustainable energy. A total of 65 papers from various institutions were reviewed and presented, demonstrating the high quality of research. Prof Sampson Mamphweli from SANEDI gave the opening address, and keynote speakers from the industry shared practical experiences towards achieving sustainability in Southern Africa. Attendees engaged in insightful discussions and presentations covering a wide range of topics, providing valuable insights into the latest developments in renewable and sustainable energy. The conference served as a catalyst for collaboration, innovation, and the transition towards a cleaner, greener energy future.

During this event, the Centre for Renewable and Sustainable Energy Studies (CRSES) team took the opportunity to exhibit the SOLTRAIN project, showcasing the project's goals, sharing informative materials, and providing detailed information to the attendees, contributing to a broad awareness of the project's influence in the field of sustainable energy.



Colleagues from CRSES, SANEDI and DSI attending the SASEC 2023 conference



Delegates at the SASEC 2023 conference

SU Environmental Sustainability Expo, 13-14 April 2023

The theme of the SU Environmental Sustainability Expo, which took place on 13 and 14 April 2023, was 'Invest in our Planet'. The two-day exhibition formed part of a week-long celebration of events that led up to the International Earth Day celebrations on 22 April 2023. This annual event is celebrated campuswide, and 2023 was used to showcase the partners who are helping SU reach its goals.

CRSES took part in the SU Environmental Sustainability Expo by setting up an exhibition to show support and to align ourselves with the NetZero Campaign.



Environmental Sustainability Expo 2023, 13 April 2023

International Centre for Sustainable Carbon (ICSC) and Eskom Workshop, 19-20 April 2023

The 2nd ICSC workshop on the Energy Transition was hosted in Cape Town by the ICSC and Eskom over two days, on 19 and 20 April 2023. The theme was 'The energy transition – Identifying the realities for power generation and the wider economy'.

Various sessions were held, with topics including **Policymaking** – how it influences the use of coal in various countries; **Coping with renewables**, which was a more technical session on introducing flexibility to coal-fired units and managing the grid; whilst the session on the **Just energy transition** focused on the cleaner use of coal for power generation.



The acting director of CRSES, Prof Wikus van Niekerk, visits the Centre's exhibition



Eskom Energy Transition Workshop 20 April 2023

Stellenbosch University Open Day, 6 May 2023

Stellenbosch University held its annual open day on Saturday, 6 May 2023. This event is open for learners from grades 11 and 12, as well as their parents and teachers. The CRSES exhibition stand focused on informing visitors about renewable energy, our postgraduate short courses, and the basic requirements to become an engineer.



SU Open day, 6 May 2023

SASOL Exhibition, 14 June 2023: Docking of the Energy Observer

Sasol sponsored the first-ever African stopover of Energy Observer, the world's premier renewable energy hydrogen-powered vessel, which docked at the V&A Waterfront in Cape Town from 12 to 20 June 2023. The Observer is a floating laboratory that showcases the potential of sustainable energy systems by harnessing solar, wind and hydrogen power. The vessel is a remarkable symbol of renewable energy innovation and the only one of its kind. On Wednesday, 14 June 2023, CRSES exhibited its research at the V&A Waterfront.



CRSES's Don at the SASOL Exhibition

AWARENESS AND OUTREACH continued

Old Mutual Energy Indaba, 13 October 2023

Old Mutual hosted the Energy Indaba at Mutual Park in Pinelands, Cape Town on 13 October 2023. The event was centred around the theme, 'Conversations with Small and Medium-Sized Enterprises (SMEs) to Enable Them to Navigate the Energy Crisis'.

The key goal of the event was to facilitate a thought-leadership dialogue with the aim of emphasising Old Mutual's commitment to supporting SMEs to effectively navigate the economic challenges stemming from the energy crisis. In addition, the event aimed to provide businesses that were not part of the alternative energy supply value chain at the time with insights into how they could potentially participate in the future. The programme encompassed engagements with key provincial stakeholders, including the Western Cape Premier, the special adviser to the Premier on energy in the Western Cape, Old Mutual Alternative Investments, as well as various other influential entities dedicated to supporting the development of SMEs.

The event brought together exhibitors from financial institutions, as well as players in the alternative energy/electricity sector who could offer potential alternative solutions to SMEs. This provided CRSES the opportunity to showcase its array of activities, such as the SOLTRAIN+ project initiative, to a varied audience comprising SMEs within the food and beverage industry as well as the building sectors.

The CRSES team shared information on the core objectives of the SOLTRAIN+ project, the role it has played in contributing to the industry, showcased demonstration systems by showing videos to raise awareness, distributed relevant information and marketing material, and discussed opportunities available through the SOLTRAIN+ project, including training offered and the co-funding scheme. Participants showed great interest in learning about the project, particularly the training courses offered.



Colleagues from CRSES, SANEDI and DSI attending the SASEC 2023 conference

EVENT THEME:

'Conversations with Small and Medium-Sized Enterprises (SMEs) to Enable Them to Navigate the Energy Crisis'



CRSES exhibits at the Old Mutual Energy Indaba

SA Green Hydrogen Summit, 16-17 October 2023

The Centre for Renewable and Sustainable Energy Studies (CRSES) proudly showcased its work at the South African Green Hydrogen Summit (SAGHS), held on 16 and 17 October 2023. CRSES took the opportunity to participate in this important event on the basis of being a leading research institute in the field of renewable energy and sustainable development.

The SAGHS served as a platform for experts, industry leaders and stakeholders to come together and discuss the future of hydrogen energy in South Africa. With the country's growing focus on renewable energy and the transition to a low-carbon economy, hydrogen has emerged as a key player in the energy landscape.

At the summit, CRSES set up an exhibition stand to highlight its research and innovations in the field of renewable energy, and visitors to the stand had the opportunity to learn about CRSES's projects in this regard.

In showcasing its research and projects, CRSES actively engaged with summit attendees, participating in discussions, networking sessions, and knowledge-sharing opportunities. The summit provided a valuable platform for CRSES to connect with industry partners, government officials and fellow researchers, fostering collaboration and advancing the development of hydrogen energy in South Africa.

Overall, the CRSES's participation in the South African Hydrogen Summit was a success. By sharing its expertise and innovations, CRSES confirmed its commitment to driving sustainable energy solutions and contributing to the country's transition to a cleaner, more sustainable energy future.



CRSES staff at the SA Green Hydrogen Summit



Minister of Electricity Kgosientso Ramokgopa, and DSI's Somila Xosa

Science Forum South Africa (SFSA), 6-8 December 2023

CRSES took part in the Science Forum South Africa (SFSA), which took place at the CSIR International Convention Centre in Pretoria, South Africa from 6 to 8 December 2023. This forum allowed participants to openly engage in discussions on issues at the intersection of science and society.

As a renowned research centre dedicated to sustainable energy solutions, the Centre for Renewable and Sustainable Energy Studies used the opportunity to exhibit its cutting-edge research and innovative initiatives.

Being part of the Science Forum South Africa was a valuable experience for CRSES, as it was able to engage with a diverse audience, learn from other researchers, and contribute to important conversations about the role of science in the world. We are excited to continue sharing our research and making a difference in science, renewable and sustainable energy, and society.

Dr Richmore Kaseke, Mrs Sedzani Ratsibi, Mrs Inge-Rae Scholtz, and Mrs Fhatuwani Mulaudzi from CRSES attended the forum.



CRSES staff at the SA Green Hydrogen Summit

INTERNATIONAL COOPERATION

2023 Science Diplomacy for Economic Development through Hydrogen (SDEDH) Workshop Series

influential in driving forward the hydrogen economy plan in South Africa. Through a series of workshops, both locally and internationally, stakeholders have come together to discuss and collaborate on various aspects of hydrogen technology, policy and investment. Below is a summary of the key highlights of each workshop:

Workshop 1: Hydrogen as a Lever for Social Justice

This was the inaugural workshop, held in Cape Town in 2022. It focused on the potential of hydrogen to promote social justice and transition to cleaner energy sources and marked the beginning of the SDEDH roundtable engagements and set the stage for future discussions.

Workshop 2: World Hydrogen 2023 Summit & Exhibition

South Africa's delegation to the Hydrogen Summit, held in Rotterdam, Netherlands in May 2023, was led by the Minister of Public Works and Infrastructure, Mr Sihle Zikalala, and the Presidency Infrastructure Office. South Africa's participation led to significant commitments to green hydrogen projects. Notable achievements include the establishment of the SA-H2 Fund, with EUR 50 million in grant funding to support green hydrogen initiatives.

Workshop 3: SA-Japan Roundtable Workshop

This workshop, which took place in Pretoria, South Africa in June 2023, aimed to strengthen strategic partnerships with Japan in the hydrogen economy. A Memorandum of Cooperation (MOC) was signed between South Africa and Japan, laying the groundwork for collaborative projects and technology development.

Workshop 4: Green Hydrogen Business Forum

During the Dutch Prime Minister's visit to South Africa in June 2023, the Green Hydrogen Business Forum facilitated investment opportunities and partnerships between South African and Dutch companies. The establishment of the SA-H2 Fund further emphasises the commitment to green hydrogen development.

Workshop 5: Skills to Enable the Development of the Hydrogen Economy

In October 2023, the Department of Higher Education and Training hosted this workshop in Pretoria, South Africa. The workshop identified skills necessary for the hydrogen economy and launched the Hydrogen Learning Platform, a cooperation between Dutch and South African companies.

Workshop 6: EU Hydrogen Week 2023

South Africa participated in the EU Hydrogen Week in November 2023, where it showcased its activities in the hydrogen economy, promoting the country as a preferred destination for investment and collaboration.

The SDEDH Workshop Series has been a critical contributor to promoting collaboration, attracting investment, and elevating South Africa's position in the global hydrogen economy. These workshops have been influential in driving progress and highlighting the potential of hydrogen technology in addressing sustainability challenges.

EU Hydrogen Week, 20-24 November 2023



South African (SA) delegation at the EU Hydrogen Week in Brussels, 2023

7th SOLTRAIN Conference, Windhoek, Namibia, 22-24 November 2023

The SOLTRAIN+ project, which commenced in January 2023, heralds four more years of innovative developments in Southern Africa's renewable heating and cooling sector. This was one of the main conclusions reached at the 7th SOLTRAIN+ Conference, held from 22 to 24 November 2023 at the Safari (Mercure) Hotel in Windhoek, Namibia.

The conference was organised by the SADC Centre for Renewable Energy and Energy Efficiency (SACREEE), in partnership with the Namibia Energy Institute (NEI) and the AEE Institute for Sustainable Technologies (AEE INTEC), generously supported by funding from the Austrian Development Agency (ADA). The conference drew over 120 participants from Angola, Australia, Austria, Botswana, Democratic Republic of the Congo, Kenya, Lesotho, Malawi, Mauritius, Namibia, South Africa, Tanzania and Zimbabwe.

The conference was opened by the Hon. Kornelia K. Shilunga, Deputy Minister of Mines and Energy in Namibia, and Ms Brigit Weyss from ADA.

One of the conference highlights was the showcasing of locally installed SOLTRAIN+ demonstration projects during the technical tours of the Katutura State Hospital, the National Housing Enterprise and Joe's Beerhouse Restaurant in Windhoek. These tours were facilitated by the NEI.

The breakout sessions delved deeply into several pertinent topics, such as the future role of solar thermal technology in Southern Africa, gender equality in solar, adequate financial instruments for roll-out programs, required training activities, and optimal approaches to engage with the industrial sector.

One of the Soltrain+ work packages, Workpackage 5, focuses on gender and diversity. At this year's conference, the first gender and diversity side event, in the form of a Networking Cocktail, was included as part of the proceedings, thus shedding light on opportunities for and barriers to women entering the renewable heating and cooling sector.

The keynote address was delivered by the Hon. Kornelia Shilunga, Deputy Minister of Mines and Energy, who focused on how woman can overcome various barriers to become influencers in government.



Participants at the SOLTRAIN+ Technical Tour at Joe's Beerhouse



The gender and diversity side event group picture, with the Hon. Kornelia Shilunga, Deputy Minister of Mines and Energy of Namibia



Participants at the SOLTRAIN+ 7th Conference held on 23 November 2023

INTERNATIONAL COOPERATION *continued*

Training Activities

Train-the-Trainer Course

The Centre for Renewable and Sustainable Energy Studies (CRSES) hosted the SOLTRAIN+ Train-the-Trainer course at the Stellenbosch Institute for Advanced Study (STIAS) in Stellenbosch, South Africa from 25 to 26 May 2023.

This course was designed to enhance the skills of participants in system dimensioning and the design of medium- to large-scale pumped solar thermal systems. It primarily targeted individuals seeking to further their training and disseminate their knowledge to artisans in both the private and public sectors through educational sessions. A total of 11 participants attended the course, including academics from universities and VTC colleges, as well as representatives from solar thermal companies, who showed a strong interest in the programme. However, attendance by the main target group was notably low, underscoring the necessity for more strategic engagement strategies to boost and encourage participation in future training sessions.



Participants in the Train-the-Trainer Course

I/C Training Course

The SOLTRAIN course on energy assessment and thermal energy efficiency for the industrial and commercial sectors was hosted by the CRSES at the Stellenbosch Institute for Advanced Study (STIAS) in Stellenbosch, South Africa from 22 to 23 May 2023.

This course aimed to provide participants with the necessary knowledge and skills to evaluate energy efficiency and apply renewable heating and cooling (RHC) principles in industrial and commercial applications. The course attracted 14 participants from diverse backgrounds, including academia and solar thermal installation companies, all of whom showed a great deal of interest in the curriculum. However, there was a noticeable lack of attendance by industry professionals, indicating a pressing need for strategic engagement with the industry to effectively promote SOLTRAIN activities, particularly in the Western Cape region.



Participants in the I/C Training Course

Technical Tour

The CRSES facilitated a technical tour of a selection of SOLTRAIN demonstration sites, including the Stellenbosch University testing facilities, Huis Horison, and the CBC brewery, on 27 May 2023. This educational excursion was attended by eight participants from academic institutions and solar thermal installation companies.

The objective of the tour was to increase awareness and to offer a practical educational experience. It aimed to bridge the gap between theoretical knowledge and practical application, thereby boosting understanding and enthusiasm in this field.



Participants in the Technical Tour, on the STERG rooftop lab at SU

Scientific Dissemination

S-@cesss-4th International Conference, 26-28 April 2023

The 4th International Conference on Solar Technologies & Hybrid Mini Grids to improve energy access was hosted by the University of the Balearic Islands in Mallorca, Spain from 26 to 28 April 2023. The primary goal of the conference was to establish a dynamic networking hub that would bring together academia and commercial companies for dialogue on the practical aspects of energy access projects worldwide. This platform aimed to facilitate valuable interactions among field practitioners, scholars, financiers and development agencies committed to decentralised energy access and community development.

The event was attended by Mr Lavhe Maluleke of the Centre for Renewable and Sustainable Energy Studies (CRSES) at Stellenbosch University. Mr Maluleke did a presentation on the performance evaluation of a hybrid space- and water-heating system that incorporates solar, biomass and heat pump energy sources. This demonstration system, implemented in a residential house in Milnerton, Cape Town, South Africa, was co-funded by the SOLTRAIN project. The presentation provided perspectives on the efficiency and feasibility of hybrid energy systems, contributing to the broader dialogue on access to sustainable energy.



CRSES Lavhelesani Maluleke presenting at the S-access conference

FIP-WEF@SUN

S Mile Solutions (Pty) Ltd – Fraunhofer Spin-off Commences Work

Help for the Last Mile in the Sub-Saharan Region

The sub-Saharan region often grapples with challenges like a lack of clean water, unreliable electricity grids, and inadequate primary healthcare services. Recognising this, the Fraunhofer Institute for Surface Engineering and Thin Films IST, and the Fraunhofer Institute for Solar Energy Systems ISE, joined forces to establish S Mile Solutions (Pty) Ltd, a startup based in Stellenbosch, Western Cape, South Africa. S Mile specialises in providing smart, small-scale and off-grid infrastructure solutions that are mounted on commercially available pick-up trucks.

This innovative approach enables companies and institutions to reach rural and remote communities with essential services and products, aiming to improve the living conditions and prospects of vulnerable communities in rural sub-Saharan Africa. The startup's mission, encapsulated in 'Smart Last Mile Solutions' (S Mile), focuses on supplying clean water and electricity, implementing hygiene measures, and facilitating telecommunications for primary health care, thereby enhancing the overall well-being of these communities.

Future Plans and Collaboration

As a startup, S Mile is initially concentrating on providing self-sufficient preclinical platforms for primary health care. Dr Lothar Schäfer, a founding member, highlighted the company's plans to expand its product range to support various sectors, including wildlife and nature conservation, agriculture, mining, tourism, disaster relief, and research platforms. Supported by joint projects between the Fraunhofer institutes IST and ISE, and the Fraunhofer Innovation Platform for the Water-Energy-Food Nexus at Stellenbosch University (FIP-WEF@SU), S Mile has received

crucial backing from the Fraunhofer Venture Group and the Fraunhofer Future Foundation.

Driven by a commitment to sustainable development, S Mile plans to further collaborate with Fraunhofer and other partners to develop, adapt and deploy infrastructure solutions in the field. Through these efforts, S Mile aims to make a significant and lasting impact on rural communities in sub-Saharan Africa, supported by its innovative business model and strategic partnerships with industry and academia.



INTERNATIONAL COOPERATION continued

ARUA

The African Research Universities Alliance (ARUA) network has partnered with the Grand Challenges Research Fund (GCRF), and each ARUA Centre of Excellence (CoE) received an award to build the research capacity of African researchers. The fund supports research to address challenges faced by countries in the global South. The fund is part of the UK's official development assistance (ODA) and addresses the United Nations Sustainable Development Goals by maximising the influence of research and innovation to improve lives and opportunities in the global South.

The ARUA CoE in Energy, based at Stellenbosch University, has set out a programme of activities to engage young African researchers and afford them the opportunity to enhance their research skills and capabilities, firstly through some of the structured courses designed and presented by the African Centre for Scholarship at Stellenbosch University, and secondly by providing opportunities for 'learning-while-doing', during which young researchers participate in research projects and learn from seasoned African academics while doing so. Through this programme, the ARUA CoE in Energy hopes to contribute toward the development of some of the promising young African academics, strengthen the renewable energy research on the continent, and build lasting partnerships between African institutions.

The Capacity Building Project of the ARUA CoE in Energy aims to strengthen research capacity in the critical field of energy, and particularly in multidisciplinary approaches that employ renewable energy as an enabler for the safe, affordable and equitable provision of basic services, and for the strengthening of the African food and agriculture system. The ARUA Capacity Building Project continues to make steady progress and had a successful year in 2023. The CoE has been very active in terms of engaging outside parties and stakeholders by hosting its second on-site capacity-building workshop, from 23 to 27 November 2023, this time in Accra in collaboration with partners

from the University of Ghana. During the workshop, the CoE made good progress engaging with a core group of researchers, with participants from the University of Addis Ababa, Makerere University, Usmanu Danfodiyo University, the University of Ibadan, the University of Ghana, Stellenbosch University, the University of Dar es Salaam and the University of Maasai Mara in attendance. The workshop introduced participants to various projects being conducted at all the CoE's partner institutions, including research on sustainable aviation fuels, photocatalysis for oil remediation, and community renewable energy projects. The workshop introduced several postgraduate students to system dynamics modelling and its application in the energy sector, and included an engaging session on photocatalysis and its energy applications, facilitated by collaborators from the University of Ghana. The workshop also provided training on grant writing to early career researchers and seasoned academics alike.

In addition to the on-site workshop, the CoE in Energy managed to train more postgraduate students. A particular highlight was having some of the students from the CoE's spoke universities join the on-site Winter School in Stellenbosch.

Lastly, the Africa-Europe Clusters of Research Excellence (CoRE) was launched between ARUA and the Guild of European Research-Intensive Universities (The Guild) earlier in 2023. The CoE in Energy forms part of the Renewable Energy CoRE group, along with partners from the University of Ghana, Makerere University, the University of Ghent, the University of Oslo and the University of Groningen. The Renewable Energy CoRE group successfully hosted its first meeting on-site in Stellenbosch from 13 to 15 November 2023. This meeting brought together a core group of researchers and plans for the coming year were set in motion.

It is anticipated that the CoE in Energy will accelerate its activities and output going into the next year, especially with the newly formed ARUA-The Guild Renewable Energy Cluster of Research Excellence.



The ARUA Guild Clusters meeting



The Capacity Building Workshop in Accra



CRSES Dr Richmore Kaseke, Prof Cristina Trois and Fhatuwani Mulaudzi at EU Hydrogen Week 2023, in Brussels

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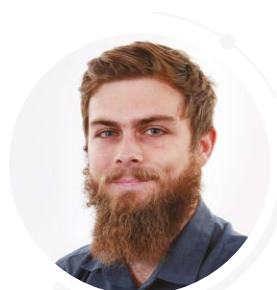
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Hulisani Mulaudzi

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STATEMENT OF INCOME AND EXPENDITURE

Until December 2023

For the period ending :	31/12/2023	31/12/2022
TOTAL INCOME	(30 000 470.27)	(33 606 014.15)
CONFERENCE/CONGRESS	-	(279 424.04)
CONTRACT RESEARCH	(9 459 857.29)	-
DONATION	(400 000.00)	-
INCOME FOREIGN	-	(65 034.67)
INCOME: BURSARY	(9 597 826.23)	(25 551 997.42)
INCOME: FOREIGN	(4 554 010.48)	(2 811 767.96)
INCOME: SUNDRY	(746 992.20)	(82 500.00)
INCOME: DST	(297 296.29)	-
INTEREST RECEIVED	(2 391 173.99)	(1 425 016.48)
PROFIT: EXCHANGE RATE FOREIGN	(18.70)	(3 295.48)
SALE: MOVABLE ASSETS	(71 304.35)	-
SALES	(955 806.69)	-
SALES: HANDBOOKS & MANUALS	-	(1 742 979.55)
SALES: TO INTERNAL ORG UNITS	(129 370.30)	(384 998.55)
SHORT COURSE INTERDEPARTMENTAL	(1 088 500.00)	(717 000.00)
SHORT COURSES	(308 313.75)	(540 000.00)
SHORT COURSES STUDENTS	-	(2 000.00)
TOTAL EXPENDITURE	45 586 548.69	34 115 380.03
ADVERTISEMENTS: GENERAL	-	26 875.00
AFFILIATION & REGISTRATION	1 268 077.29	763 864.13
AUDIOVISUAL EXPENDITURE	17 804.00	23 589.60
AUDIT FEES: EXTERNAL	91 623.12	54 450.29
BANK COSTS	-	249.90
BURSARY POST GRADUATE	1 182 093.88	2 407 967.46
CELL PHONE AIRTIME	-	3 140.17
CELL PHONE RENT	-	3 940.35
CHEMICALS	-	105.42
CLEANING COSTS	17 756.67	36 908.88
CLEANING MATERIALS	8 365.75	3 813.76
CLOTHING: OTHER	6 628.30	34 090.84
CLOTHING: PROTECTIVE	776.87	423.69
COMPUTER MATERIALS	11 455.38	16 283.85
CONFERENCE/CONGRESS REFUND	44 000.00	-
CONSULTATION FEES	1 853 568.93	249 988.17
CONSUMABLE MATERIALS	33 262.01	18 428.37
COPY AND PRINTING	85 063.71	89 965.02
COPYRIGHT	-	3 200.00
COURSES	66 725.00	25 066.94
CROCKERY	973.17	-
ELECTRONIC COMPONENTS	-	97 834.43
ENTERTAINMENT: GENERAL	2 869 385.61	148 112.49
FOREIGN EXCHANGE LOSS	114 782.75	770.73
FUEL, OIL, LUBRICANTS	5 884.70	40 828.03
GENERAL OFFICE COSTS	2 625.19	14 423.33
GENERAL RESEARCH COSTS	1 404 000.00	1 630 260.87
GENERAL VEHICLE EXPENDITURE	-	1 238.59
GIFTS	1 752.36	1 374.79
ICRR (INDIRECT COST)	3 165 114.72	(4 254 085.98)
INS, LICENSES & 3RD PARTY	48 826.09	-

For the period ending :	31/12/2023	31/12/2022
INSURANCE - OTHER	7 023.69	-
INTEREST PAID	107 017.89	5 125.53
INTERNET NETWORK EMAIL LEVY	142 185.48	94 388.47
SMALL ASSETS	12 098.38	-
LINEN	-	205.65
MAINTENANCE BUILDINGS-STELLENBOSCH	283 833.83	-
MEDICAL EXPENSES	-	1 650.00
PHOTOGRAPHIC EXPENDITURE	-	17 978.12
POSTAGE AND COURIER SERVICES	19 939.58	17 688.66
PRIZES AND MEDALS	5 500.00	6 997.00
PROMOTION MATERIAL	-	13 867.50
REFRESHMENTS: NON ACADEMIC	28 676.61	112 034.43
RELOCATION COST: NEW APPOINTMENT	-	6 650.00
RENT OF EQUIPMENT GENERAL	5 869.90	-
RENT OF ROOMS	54 450.00	-
RESEARCH MATERIALS	1 536 782.60	-
RESEARCH PUBLICATIONS	-	134 870.40
RESEARCH CONTRACT CONDUIT PAYMENT	-	5 314 782.61
SECURITY SERVICES	3 299.33	-
SERVICES	15 180 520.40	9 040 625.14
SMALLER FURNITURE AND EQUIPMENT	484 131.36	10 575.95
SOFTWARE	483 347.37	134 164.21
STATIONERY	31 157.88	28 674.56
SUBSCRIPTION & MEMBERSHIP FEES	17 603.11	21 883.74
SUNDRY EXPENSES	37 644.23	-
TELEPHONE: CALLS	4 371.45	5 559.28
TELEPHONE: RENT	18 823.34	25 120.96
TOTAL REMUNERATION	10 641 729.24	13 644 438.97
TRANSLATION AND EDITING	9 070.00	55 377.00
TRAVEL: ACCOMMODATION VISUM PA	519 182.86	563 320.74
TRAVEL: FOREIGN TRAVEL SUBSISTENCE	361 711.24	540 913.16
TRAVEL:DAILY ALLOWANCE AIR CAR	1 124 525.96	583 782.71
TYRES	-	3 056.93
US - MUN ELECTRICITY	2 000.00	-
WORKSHOPS	755 752.55	1 316 848.44
ASSET TRANSACTIONS		
ASSET SCRAPPING/TRANSFERS		(86 380.23)
DEPRECIATION		369 727.79
INCOME: INTERNAL ASSETS		(283 347.56)
PROFIT/LOSS: ASSETS		135.00
ASSET ADJUSTMENTS	-	(135.00)
ASSET PURCHASES	1 407 754.91	971 690.75
OPERATING (SURPLUS) / SHORTFALL FOR PERIOD	15 586 078.42	509 365.88
FUNDS TRANSFERS	(1 659 582.21)	10 905 172.20
TRANSFERS FROM	10 733 363.11	29 876 153.74
TRANSFERS TO	(12 392 945.32)	(18 970 981.54)
NET (SURPLUS) / SHORTFALL FOR THE PERIOD	13 926 496.21	11 414 538.08
Plus: ACCUM (FUNDS) / SHORTFALL ON 01/01/2023	(38 300 419.09)	(49 714 957.17)
ACCUM (FUNDS) / SHORTFALL ON 31/12/2023	(24 373 922.88)	(38 300 419.09)

FINANCIAL POSITION OF THE CENTRE

The Centre has three main sources of income: a core grant from the Department of Science and Innovation, annual funding from Eskom, and income from research projects and short courses offered.

CRSES received a core grant from the Department of Science and Innovation. The annual grant from the DSI is mainly to support the appointment of three senior academics at Stellenbosch University, provide bursaries for postgraduate students and contribute to the running expenses of the Centre as well as funding for the renewable energy spokes. In 2023 a total amount of R22 148 284.00 was paid to the Centre. This includes a total of R 8 604 000.00 earmarked for the various spokes, i.e. Solar Thermal Spoke at SU and UP, the Wind Spokes at SU and UCT, the Photovoltaic Spokes at UFH and MNU. An amount of R10 641 729.00 were spend on salaries of chair, senior academic staff and administrative staff. R1 182 093.88 was paid out as postgraduate bursaries.

No contributions were received from Eskom since the Centre were awaiting approval of the new proposal.

The remainder of the income comes from a number of private and public entities for contract research projects, and from short and in-house training courses.

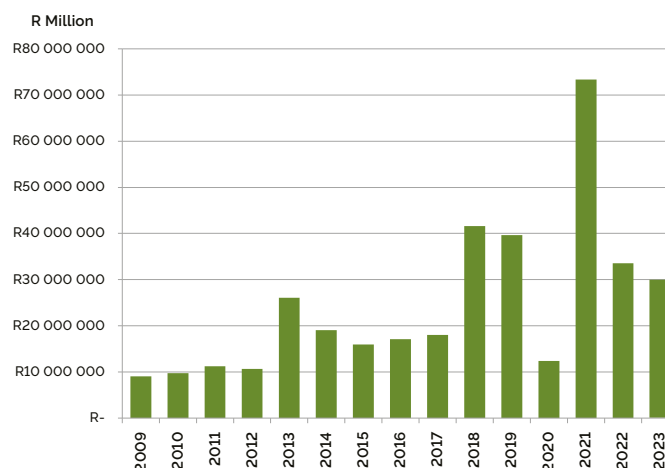
The comprehensive income statement of the Centre for all cost points, including project funds, is included on page 22 and 23. The overall income of the Centre until December 2023 was R30 000 470.27, a slight decline of R3 million due to no contributions from Eskom for 2023 financial year. The total actual funding available at the end of December 2023 was R24 373 922.88 as can be seen in the table that follows.

The Centre showed sustained growth in income from 2018. With more than R24 million in reserves, the Centre is in a favourable financial position for 2023. However, with a declining of R6 million in reserves from 2022 and a higher total expenditure, it is important that the Centre further diversifies current income streams.

Funds available at CRSES

	31 Dec 2023 (12 months) (R)	31 Dec 2022 (12 months) (R)
Total Income to Date	R30 000 470.27	R33 606 014.15
Total Expenditure to Date	R45 586 548.69	R34 115 380.03
Total Transfers	R1 659 582.21	R10 905 172.20
Total Equipment Acquisitions	R1 407 754.91	R971 690.75
Total Post-graduate bursaries	R1 182 093.88	R2 407 967.46
Total Remuneration	R10 641 729.24	R13 644 438.97
Nett Surplus for period	R13 926 496.21	R11 414 538.08
Accumulated funds from previous year	R38 300 419.09	R49 714 957.17
Funds available 31 December 2023	R24 373 922.88	R38 300 419.09

Annual income of the Centre



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