

Collaborative Solar Initiatives Shine Bright in Southern Africa

The combination of abundant solar energy resources and heavy reliance on fossil fuels has led many African nations to look to the sun for solutions. And not surprisingly, they are finding solar solutions for all different applications and community needs. Here are highlights from four of our Southern Africa member countries.

Botswana Public Private Partnerships Tackle Sustainable Development Goals

Botswana, a landlocked country, relies heavily on coal and other fossil fuels for energy production, which it primarily imports from neighboring countries, in particular South Africa. The small share of renewables is dominated by bioenergy, but the potential for solar is immense. Botswana has abundant solar energy resources. Receiving over 3,200 hours of sunshine per year with an average insolation on a horizontal surface of 21MJ/m², it has one of the highest rates of insolation in the world.

An alternative care home, SOS Children's Village, and a boarding school for children with learning disabilities, Camphill Community Trust, are set to receive and benefit from the installation of 50 thermosyphon solar geysers. The solar geysers will directly improve the lives of 240 people, thanks to grants from the SOLTRAIN IV project, funded by the Austrian Development Agency (ADA), and a locally based mining company, Debswana Diamond Company, the world's biggest diamond producer by value.

These two organizations have teamed up with SOLTRAIN trainers and member companies of the Solar Industries Association Botswana (SIAB) to install a total of 120 m² of collectors, which will create a long list of benefits – job creation, long-term financial savings, energy savings, contributions towards national carbon emission targets, training of artisans and maintenance teams, and public awareness for the technologies. The long-term benefits of the partnership are expected to extend beyond the project into collaboration on other initiatives to promote the use of renewable energy in more communities.

SIAB, registered under the societies act in 2005, is a group of locally based companies working in solar thermal and photovoltaics fields. Using a unified voice, they advocate for a wider uptake of solar technologies in the country by disseminating information, fostering high standards of practice, and cultivating good ethics and ideals. The association became a partner coordinator to the SOLTRAIN IV project in 2019 to support the lead coordinating partner, the Clean Energy Research Centre (CERC) based at the University of Botswana, in their work and to build close working relationships with the private sector. The project is regionally coordinated by the Austrian Research Centre AEE INTEC.

The SOLTRAIN project has been operating in Botswana for two phases (six years) and focuses on solar thermal technologies in six SADC region countries. The need for this project in the



▲ Water heater to be replaced at Camphill Community Trust.



▲ Solar Collectors to be replaced at SOS Village Tlokweg.

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2030 Targets for Solar Thermal Collector Area

Country	Estimated average collector area per inhabitant by 2030	Estimated installed collector area by 2030	Installed collector area at the end of 2020*	Roadmap launch
Botswana	0.3 m ² per person	910,000 m ²	17,275 m ²	February 2018
Lesotho	0.5 m ² per person	~1.1 M m ²	4,257 m ²	June 2019
Namibia	0.5 m ² per person	1.5 M m ²	54,372 m ²	February 2019
South Africa	0.5 m ² per person	~30 M m ²	2,493,082 m ²	September 2015

region came from the deficit in power supply and the ability of thermal technologies to reduce reliance on the grid by up to 50%. The initiative has successfully restored trust in solar technologies tarnished by poor design, selection, and installation.

The project's focus is capacity building, knowledge transfer, financial incentives, supporting regulatory framework, research and development, and public awareness. The benefits for the association members have been numerous. They include training in solar thermal design, technical support in developing initiatives, public awareness, business meetings with local organizations, networking with regional institutions, supply chain, and accessing grants for demonstration projects, including this collaborative project with Debswana.

Debswana is a diamond mining company based in Botswana that contributes about 30% of the GDP to the country annually. The company's sustainability and carbon neutral goals and strategic plan for 2030 align closely with the SOLTRAIN project and SIAB, which led to the company supporting the collaborative solar project through its Corporate Social Investment program. Debswana's six company values drive the company to meet its objectives passionately and pride itself on upholding the qualities. Three of the six values stand out for this project, "pull together," "show we care," and "shape the future," all of which are significant in shaping the key performance indicators. This project, which is set to be completed by September 2022, would not have reached inception without the company "showing they care" by "pulling together" with ADA/SOLTRAIN and SIAB to "shape the future" of these social institutions and the extension in supporting local SMEs.

The Solar Industries Association Botswana, Camphill Community Trust, and SOS Children's Village would like to extend their gratitude to the Austrian Development Agency, AEE INTEC, the Clean Energy Research Centre, and Debswana for contributing to the development of this project. We look forward to a collaborative future in working toward Sustainable Development Goals (SDGs).

Contributed by Karen Gibson, the Solar Industries Association Botswana, Botswana SOLTRAIN partner Coordinator.



▲ Inception meeting with Debswana at SOS Village Tlokweng.

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Lesotho

Teaching and Training a New Solar Generation

Lesotho produces electricity from hydro sources, but not enough to meet the country's demand, so it relies on energy imports from neighboring countries to meet its growing demand. But, bolstered by the National Policy 2015-2025, the energy sector guideline, the promotion and development of renewable energy are growing. And one of the key players has been the Bethel Business and Community Development Centre, where technical and commercial education and training combine.

BBCDC is a technical and commercial school with 250 full-time students and 17 full-time staff located 250 km south of the capital Maseru. It began operations in 1993. Lesotho is a landlocked country at a high altitude in Southern Africa with a population of 2 million and 35,000 square km in area. Solar energy utilization is a core curriculum component at BBCDC and central to all operations. This community is not connected to the national electricity grid and relies entirely on solar energy systems.

Today, five heavy-duty solar power systems are operating on the campus, providing electricity for all applications, including welding, refrigeration, kitchen appliances, computer labs, lighting, shop equipment, and irrigation pumps. An average 150kWh/day of electricity is being produced. In addition, over 6,000 liters of hot water are produced by direct thermal technology each day, which translates into 330 kWh energy equivalent. The annual value of energy produced by solar electrical and thermal power based on M2.00/kWh is about M350,000.00 (M1.00 = R1.00 = USD0.063, June 2022). Solar thermal systems are used extensively for water heating, cooking, space heating (passive design), cooling (solar chimneys and radiation), greenhouses (3), and daylighting. Solar water heaters include a 500-liter pumped system and numerous low- and high-pressure water heaters employing evacuated glass tubes. Several different types of solar cookers operate daily on the BBCDC campus and most recently include promising large evacuated tube designs. And nine guest rooms for visitors are served entirely with solar water heating.

In 2000, experience gained from the practical application of solar technology on the campus was used to start a solar business. A trademark: "Solarsoft" was registered, inspired by the work of Amory Lovins, who used the term "soft energy paths" for decarbonization and transition to renewables. Solarsoft is headquartered in Mochale's Hoek and operates throughout Lesotho with four full-time technicians. From 2014 to 2022, BBCDC is the lead regional Southern African Solar Thermal Training and Demonstration Initiative (SOLTRAIN) partner for Lesotho, which is a joint program of AEE INTEC and the Austrian Development Agency. SOLTRAIN is advancing technical, commercial, and engineering capacity for solar thermal adoption and adaptation. BBCDC imported five containers of solar water

► **Earthship at BBCDC: a lecture theatre using passive solar design. The south and west walls are entirely earth sheltered.**



▲ **Nthabiseng Masiloane at Solarsoft in Mochale's Hoek with evacuated tube solar cookers. She graduated from BBCDC and works as a technician and SOLTRAIN coordinator.**



▲ **SOLTRAIN technical tour for local decision-makers of high-pressure solar water heaters on May 6, 2022, at St. Elizabeth Training Institute.**



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heaters for commercial installation and constructed three large wastewater treatment systems in Lesotho that incorporate living machines and greenhouses to enhance bio-reaction.

BBCDC is in the final stages of commissioning and opening a 200 m² lecture theatre, an Earthship. Eight hundred used automobile tires were used to construct an 80 m² back-filled wall that acts as an enormous heat sink and temperature moderator. The windows and daylight features are designed for excellent solar gain, and the roof is well insulated. As Ivan Yaholnitsky of the Ministry of Education notes, “The operation of the Earthship biosphere is sheer grandeur, with the sun, water, and life in an elaborate symphony. Human technology should correspond.” The structure will primarily be used in conjunction with an adjacent solar lab for education. Solar energy application, technology, and engineering provide exceptional strategic advantage and performance for the school. If you are well prepared, there are no emergencies.

Contributed by Ivan Yaholnitsky: Principal and Managing Director of the Ministry of Education, Lesotho.



Namibia

Committed to Reaching 2030 Solar Thermal Target

Namibia is located in the Southern Sunbelt region of Africa, where access to clean energy remains a challenge. The semi-arid country is dominated by warm

weather, however, the occurrence of cold weather necessitates the need for heat for various applications. On the other hand, the country imports about 60% of its annual energy requirements from neighboring countries through the Southern Africa Power Pool, mainly South Africa, whose energy generation mix is dominated by coal. Thus Namibia is a net importer of energy. Moreover, heating and cooling in businesses and households account for between 40% and 50% respectively, which is attributed to higher electricity bills.

The government of Namibia has, through the National Energy Policy and the National Renewable Energy Policy, recognized the 2030 Solar Thermal Technology Roadmap of Namibia (STTR-Nam). The 2030 STTR-Nam aims to guide the country’s transformation from a fossil fuel-based energy economy to a low-carbon economy while improving energy access for many people in Namibia. The target of the 2030 STTR Nam is to have 1,500,000 m² collector area installed at domestic and commercial institutions, mines, hotels, hospitals, etc. by 2030. The government has further shown commitment in supporting and advocating for solar thermal. In 2007, a cabinet directive was enacted for all new public institutions’ water heating requirements to be met with Solar Water Heaters (SWH).

Solar Installation Highlights

Major installations in the country have been made by the private sector in the housing, health, hospitality, education, and housing sectors. The most recent installation is a solar water heating system at the Katutura State Hospital Maternity Ward. Installed in May 2022, the pumped solar water heating is a hybrid system that relies on a 120 m² collector area as the first heating priority and a heat pump as a second priority.



▲ Solar collectors for pumped water heating on the Katutura State Hospital Maternity Ward in Windhoek.



▲ Lady Pohamba’s 210 m² pumped solar water heating system.

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Other solar water heating systems include the largest pumped system in the country at the Lady Pohamba Private Hospital and the thermosiphon systems installed at the Orange River vineyards' low-cost housing development in Aussenkehr. All these systems were installed with co-financing under the regional Southern African Solar Thermal Training and Demonstration Initiative (SOLTRAIN) project funded by the Austrian Development Agency (ADA) through AEE INTEC. Solar water heating has also been adopted in the country by other institutions and individuals.

Current Trend

The uptake of solar heating technology in the country has started to gain momentum as many institutions and individuals are taking on the role of ensuring contribution to climate change mitigation as stipulated in Namibia's updated Nationally Determined Contribution (NDC). This comes with the added benefit of long-term energy cost savings associated with the competitive renewable energy technologies. The main drivers of this uptake are the awareness-raising programs and funding opportunities, such as those provided by the SOLTRAIN program and the Solar Revolving Fund (SRF) of the Ministry of Mines and Energy.

Contributed by Joseph T. K. Shigwedha and co-authors Helvi Ileka and Fenni Shidhika of Namibia University of Science and Technology.



▲ **Thermosiphon systems installed on 58 low-cost housing development in Aussenkehr.**

“Using solar thermal technology to reduce pressure on the national grid is not new, but we need to revive it and realize how powerful it is as a means to save electricity, ease load shedding, alleviate pressure on the national grid, save money, and reduce carbon emissions,” says Karen Surridge. “Solar thermal systems can be used at scale, from small household installations to large-scale industrial, commercial, and agricultural installations. No matter how big or small your solar thermal system is, it will help and ensure you have hot water when you need it.”

Contributed by SANEDI, May 2022 press release.



South Africa

Turning to the Sun to Relieve Overstrained Electrical Grid

A Day of the year has been allocated to the power of the sun thanks to the UN Environment Programme (UNEP).

International Day of the Sun on May 3rd recognizes and promotes the expansion of this abundant renewable energy resource.

International Day of the Sun also coincides with a major research collaboration to identify the optimal thermal technologies that companies and households can use as alternative energy sources. The first collaboration will focus on solar water heating potential using different solar technology solutions.

The move by the South African National Energy Development Institute (SANEDI) and the Council for Scientific and Industrial Research (CSIR) could take huge pressure off the overstrained national electricity grid and ease load shedding if companies switch to solar and related thermal heating and cooling technologies. Companies switching to low-carbon technologies would also shield themselves against high electricity tariff increases, save money, give themselves greater energy security, and contribute to reducing carbon emissions.

SANEDI and the CSIR have established a Thermal Laboratory that will test and compare a range of low carbon technologies and develop business cases to implement the most effective solutions at different scales, explains SANEDI Manager for Renewable Energy and South Africa's IEA SHC representative, Dr. Karen Surridge. “We want to identify the most savvy, energy efficient thermal technologies to use for heating and cooling tailored

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towards specific types of businesses and present these to companies for evidence-based consideration.”

Heating and cooling are intensive users of energy. They often account for between 40% and 50% of electricity costs in companies and households and draw large amounts of electricity from the overstretched national grid if coal-based electricity is used.

Technologies such as solar water heating are highly energy efficient. Recent examples of this have been shown by the Southern African Solar Thermal Training and Demonstration Initiative (SOLTRAIN), funded by the Austrian Development Agency and in which SANEDI is a South African partner.

SANEDI, often under the banner of SOLTRAIN, is creating awareness of Renewable Energy (RE), Energy Efficiency (EE), more specifically on solar water heating technology at military units in Limpopo province of South Africa. After only two and half years of operation, the system is already making significant savings in electricity and water.

The project paved the way for other government entities to look into installing large-scale renewable energy technologies at their facilities and hold ‘Decision Makers’ seminars to be trained on renewable heating and cooling technologies and their benefits.

Some of the many solar projects undertaken by SOLTRAIN include:

- Wits Junction student residence complex in Johannesburg estimates it will save R40 million in electricity and other costs over the 20-year lifespan of a combined solar water heating, co-generation, and gas heating system it has installed. The complex comprises 14 buildings and provides accommodation for 1,103 students who use 94,000 liters of hot water daily.
- The SA National Defence Force has saved 490,500 kWh of energy and R1,079,100 in electricity costs after installing a relatively small (3000L) solar water heating system at Air Force Base Hoedspruit in Limpopo. (Read more about this in the [Solar Update, July 2021 issue](#))
- Centurion Building retirement residence in Sea Point, Cape Town, has saved at least 470MWh of electricity and R220,000 in electricity costs since it replaced its electric boilers with a hybrid solar thermal and heat pump hot water system in 2018.
- Klein Karoo International (KKI), a major ostrich leather, feathers, and meat producer based in Oudtshoorn, Western Cape, replaced its oil fueled water heating system with a solar thermal plant and saved just over R413, 000 in its first year of operation.
- Melomed Gatesville Hospital in Cape Town has saved R130,000 a year after switching to a hybrid solar water heating and heat pump system.

In addition to being involved in the SOLTRAIN initiative, SANEDI has also managed solar thermal projects on behalf of the Gauteng provincial government. These include the installation of three 300-liter high-pressure solar water heaters, which have reduced electricity costs at Frida Hartley Shelter for Women in Johannesburg from about R40,000 to R1,000 a month and the fitting of solar water heaters that could save Sibonile Primary School an estimated R10,000 a month.



▲ **University of the Witwatersrand Junction Student Residences uses a pumped solar thermal system with a hot water storage tank and external heat exchanger. In one year, this installation gives a solar yield of 397.70 MWh and is responsible for avoiding 137,600 kilograms of CO₂ emissions.** Source: SOLTRAIN



▲ **Klein Karoo International (Pty) Ltd Tannery (KKI) installed a solar thermal plant. In one year, this solar installation generates 397 MWh and is responsible for avoiding 137,000 kilograms of CO₂ emissions.** Source: SOLTRAIN