

Unexpected Solar Thermal Partnership Catalyzes Government Collaboration, Skills, Investment and Emissions Targets

One of the roles of the South African National Energy Development Institute (SANEDI) is to facilitate and coordinate renewable energy and energy efficiency research, development, and demonstration through local and international cooperation, technology transfer, and information exchange leading to the deployment and commercialization of sustainable, efficient, reliable, cost-competitive and environmentally sound renewable energy technologies.

The South African National Defense Force (SANDF) owns and operates multiple military bases across the country where, more often than not, entire communities of military families reside. Additionally, the service infrastructure (water and energy) of small towns is often located on these military bases and serves the entire community's needs in the area. To this end, the SANDF has established a technical structure that supports the maintenance and repair of these facilities. As can be expected, water and energy infrastructure and efficiency are paramount not only to the smooth functioning of bases but also to the energy savings, emissions reduction targets, and energy security.

A partnership between SANEDI and the SANDF began intensively in 2018, collaborating on sustainable renewable energy and energy efficiency solutions for the SANDF. This alliance led to the signing of a five-year Memorandum of Agreement (MoA) to collaborate on specifically identified projects, one of which is implementing pilot projects at a military base in Limpopo, in collaboration with the Solar Thermal Training and Demonstration Initiative (SOLTRAIN). SOLTRAIN is a regional initiative for capacity-building and demonstration of solar thermal systems in the SADC region, funded by the Austrian Development Agency and co-funded by the OPEC Fund for International Development.

SOLTRAIN demonstrates ways to tap solar's potential using solar thermal systems to significantly reduce electricity demand and CO₂ emissions. Major adoption of these systems could lead to industry and associated skills development and job creation if local assembly or manufacturing is stimulated. In South Africa, SOLTRAIN is implemented by SANEDI and the Centre for Renewable and Sustainable Energy Studies at Stellenbosch University, in partnership with AEE Institute for Sustainable Technologies (AEE INTEC) from Austria.



SANEDI & SANDF Partnership Has Far-Reaching Impact

The SANDF spends a significant amount of money on the operation, maintenance, and replacement of water heating hardware in its high-density domestic housing on military bases across South Africa. Understanding the energy and cost-saving benefits of solar thermal, this uniquely executed tri-way partnership (SANEDI, SANDF, SOLTRAIN) has managed to deliver mutually beneficial outcomes to all three parties through technology implementation focused on interdepartmental government collaboration and investment, skills development in the solar thermal sector through upskilling of military artisans, and addressing governmental emissions targets through CO₂ reduction. In addition, it has catalyzed a knock-on effect on future investments in large-scale solar thermal installations at SANDF housing and hospital facilities that serve not only military personnel but also government employees and civilians.

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SANEDI, the SANDF, and SOLTRAIN collaborated to implement two solar water heating systems at the Air Force Base in Hoedspruit, Limpopo Province, which have improved energy efficiency and acted as a catalyst for upskilling SANDF personnel. The two systems, each with a 15 m² solar array collector area and 1,500-liter hot water storage, were installed at two buildings. The systems operating through a well-insulated ring main unit provide the added benefit of less water being wasted while waiting for a shower to heat up – hot water is almost instant in each of the 32 rooms once a tap is opened. A unique aspect of the pumped solar thermal systems with a 20-year life is that they consider the cohabiting bush-life, including primates, and climatic conditions at Air Force Base Hoedspruit.

To prepare the SANDF members for the projects, SANEDI held half-day awareness training seminars on renewable energy, energy efficiency, and more specifically, solar water heating at military units across Limpopo. And, to ensure the ongoing operation and maintenance of the solar thermal systems, SANEDI also provided specialized training in partnership with Stellenbosch University to 45 artisans who completed a SOLTRAIN thermosiphon course and four who were intensively trained during the systems' construction. These members were upskilled further and are transferring their skills to other SANDF artisans, thus ensuring the security of knowledge retention and a system maintenance autonomy for the SANDF.

The first project implemented through the SANEDI-SANDF collaboration went live in May 2019, and by July 2021 has realized a savings of approximately 490,300 kWh, equating to an estimated 981,000 Rand. Although the buildings are not at full capacity, it is expected that the capital costs, associated maintenance, and training will be recouped in less than 2.5 years. Furthermore, after this period, supplying hot water to these two bungalows (each supporting 16 staff members) will be "FREE," bar a minimal running cost of approximately 16,000 Rand per year in comparison with a previous cost of 150,000 Rand (per bungalow). Thus, this investment is proving to be extremely beneficial, showing a projected Internal Rate of Return (IRR) of 33% and a Return On Investment (ROI) of 570% over the 20 year lifetime of the project.

These solar water heating systems reduced electricity use and the need for the backup diesel generator, thus enabling the SANDF to provide housing with functional hot water supplies under most conditions. Before installing the two solar systems, the military facility had defunct electrical hot water systems for their medical and training personnel residing in the two buildings.

The SANDF seeing first-hand how solar thermal can reduce operating costs and improve the reliability of the hot water infrastructure on military bases, is keen to learn more about other energy savings and emissions-reducing solar technologies. And, SANEDI is confident that given the number of government and parastatal entities that own housing, this model of co-funding public sector renewable energy projects can be replicated throughout South Africa.

Article contributed by Karen Surridge of SANEDI and the South African representative on the IEA SHC Executive Committee.



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