ISSN: 3066-7194
Short Communication
Novel Journal of Applied Sciences Research

Solar Thermal Technology and Government Working Together to Cut Costs and Emissions and Boost Skills

Dr AKJ Surridge[1*], Ms K Mpheqeke[1], and Lt Col HJ Davel[2]

[1]*South African National Energy Development Institute (SANEDI), 152 Anne Crescent, Strathavon, Sandton, 2146, Johannesburg, South Africa*
[2]*Regional Works Unit Limpopo, South African National Defence Force, Cnr Dorp and Rissik streets, Polokwane, 0699, South Africa*

[*]Corresponding author: Dr AKJ Surridge, South African National Energy Development Institute (SANEDI), 152 Anne Crescent, Strathavon, Sandton, 2146, Johannesburg, South Africa. Tel: +27 11 038 4322, Website: www.sanedi.org.za

Submitted: 19 July 2024 **Accepted:** 22 July 2024 **Published:** 30 August 2024

https://doi.org/10.63620/MKNJASR.2024.1034

Citation: *Dr AKJ Surridge, Ms K Mpheqeke, and Lt Col HJ Davel (2024) Solar Thermal Technology and Government Working Together to Cut Costs and Emissions and Boost Skills. Nov Joun of Appl Sci Res 1(4), 01-03.*

Abstract

A solar water-heating installation at the air force base in Hoedspruit has demonstrated improved energy efficiency, cut costs and CO_2 emissions, and left personnel with new skills. A remarkable success story has played out at the Hoedspruit Air Force Base over the past four and a half years with solar technology at its heart. On 1 May 2019, SANEDI and the South African National Defence Force (SANDF) collaboratively commissioned two 1 500-litre solar water-heating systems to keep the bungalows that are home to the base's personnel supplied with hot water. The Solar Thermal Demonstration and Training Initiative (SOLTRAIN) contributed training and 30% of the capital required. Since then, SANEDI and the SANDF have tracked the performance of the system, specifically focusing on electricity and cost savings and translating these into tons of CO_2 emissions avoided. The numbers are nothing short of impressive – and inspirational.

Keywords: Solar Thermal Demonstration and Training Initiative (SOLTRAIN), Solar Fraction, Thermosyphon System, Artisan Upskilling, CO_2 Emissions Avoidance

Introduction

A solar water heating installation at the air force base in Hoedspruit has not only demonstrated improved energy efficiency, and cut electricity costs and CO_2 emissions, but has also acted as a catalyst for upskilling South African National Defence Force (SANDF) personnel.

The South African National Energy Development Institute (SANEDI), the Solar Thermal Demonstration and Training Initiative (SOLTRAIN) and the Department of Defence collaborated in the implementation of the solar water heating (SWH) system at Air Force Base Hoedspruit, Limpopo, South Africa.

On the 1st of May 2019 the South African National Energy Development Institute (SANEDI) and the South African National Defence Force (SANDF) collaboratively commissioned two 1500 litre solar water heating systems for military accommodation bungalows in Hoedspruit, South Africa. This project was supported through training and some financial contribution [30%] of the SOLTRAIN programme. Since the operationalisation of this project, SANEDI and the SANDF have been tracking the performance of this system, specifically focusing on electricity and cost savings and translating these to savings in tonnes of CO_2.

While all involved expected significant cost and electricity savings, no one predicted just how quickly these would be realised. In just over two years, the installation had saved enough in electricity costs to cover the capex of the hardware and associated services. The 841.5MWh that the system had saved by end of September 2023, translates into a cost saving of R1.85 million and 816.2 tons of CO_2 that had not been released into the atmosphere. The two installations are functioning at a solar fraction of 96.8%.

Considering the combined advantages of reduced electricity consumption and costs, artisan upskilling and CO_2 emission reductions, this project has proven to be a good all-round solar

thermal solution to integrate previously un-utilised technology into a government department that strives to be self-sufficient. Not only did the project introduce solar thermal technology benefits and sustainability, it also catalysed an unusual sequence of events serving the industry, the sector and government.

Performance data, in real life situations and challenges, is proving the technology's value and ability to deliver a significant return on investment. More importantly, though, the project made such a powerful case for technology acceptance, skills and capacity development and investment potential, that the SANDF has become an investor in the solar thermal sector in South Africa.

The Numbers and the Skills

These systems were conceptualised in order to offer warm water security/surety to members of the SANDF staying in bungalows at the Air Force Base. It was foreseen that there would be a significant cost and electrical savings, however what was not foreseen was how quickly this savings would begin to pay off. In just over two years the entire installation had saved enough in electricity costs to cover the capex of the hardware and associated services.

Considering the numerical success above, the project's other success story goes beyond statistics, it is important to note that there has been another equally significant contribution from this project. This project has led to the training 107 SANDF artisan members at various levels in solar thermal technologies. The training aspect of this collaborative project ensures that the Defence Force does not become reliant on civil society to maintain the hardware at its bases. It also equips artisans with skills that are in step with changes in the energy landscape and advances in technology, and paves the way for other government entities to instal renewable-energy technologies at a large scale at their facilities.

Having the necessary skills available, has already led the SANDF to invest in a domestic solar-water heating installation at another of its bases to address severe water challenges.

Training and Skills Development

SANEDI and SOLTRAIN presented a variety of training sessions to introduce renewable energy to the SANDF and upskill military artisans to maintain solar water-heating in-house:

- Thermosyphon system introductory training.
- Mini apprenticeship.
- Quality inspector.
- System calibration and servicing.
- Specialised training for solar-thermal experts and professionals.

Figure 1: Opening the systems officially in 2019

Figure 2: Servicing the systems 2021

Figure 3: Systems calibration and Service 2022

Conclusion

This project has not only introduced solar thermal technology benefits and sustainability, but has also catalysed and unusual sequence of events serving the industry, the sector and government. Data collection on the system proves the technology's value as well as investment return potential, however the intricacies behind motivating support for technology acceptance, skills and capacity development, investment potential and business case development, leading to ultimate reinvestment and growing investment, from the South African National Defence Force into the solar thermal sector in South Africa. This project catalysed a win-win situation for all parties involved and it would appear that the successes sustained herein are leading to bigger and better things to come.

Conference Topic

Renewable heating and cooling, including high temperature applications