# June 2017 SOLTRAIN Newsletter #05





WITH FINDING FROM

AUSTRIAN DEVELOPMENT AGENCY

Uniting against Poverty



SOLTRAIN Demonstration Systems at Malealea Lodge and Pony Trekking Centre in Lesotho by Ivan Yaholnitsky

Malealea Lodge is a 55 room lodge with bar, dining room, recreational hall and thriving tourism business. It is located about 75km from Maseru in the Mafeteng District and hosts approximately 5 000 visitors per year. There are 28 permanent staff, 12 temporary, 15 pony trekking guides, 30 horse owners, and 15 hiking guides working as commercial community partners. The contribution of the Lodge to the local community is immense.

In August 2016, the status quo at the Lodge was the following from a power and energy perspective: electrical power was available for 5 hours daily from 16:00 to 21:00 and

provided by a 35KVA diesel genset that burned approximately 35 litres of fuel per day. All hot water was provided by LPG instant heaters and 48kg cylinders. There was a problem with the availability of water and quality especially in summer because of intermittent flooding and contamination of the source.



#### Water supply source

Several issues of an economic and technical nature were apparent in this situation. The advent of the Sustainable Development Goals (SDGs) in 2015 provides a good framework for understanding this cluster of problems at Malealea and how they were addressed. The SDGs comprise an interdisciplinary structure which grasps the connection between problems. In plain speak you have to solve several problems all together in most instances. SDG 17 is *Partnerships for the Goals* and its underlying logic is that complex networks are necessarily involved in the solution of most problems. The basis for SDG17 is trust, discipline, organizational efficiency and excellent communications.



Refurbished water supply infrastructure

A complementary group of social, business and institutional forces combined in this example to carry out the necessary work. The network included Malealea Lodge and Pony Trekking, SOLTRAIN III Lesotho, Telecom Techniques which is major integrated renewable energy business located in Port Elizabeth, and Bethel Business and Community Development Centre/Solarsoft.

The people involved included Glen and Mick

Jones (Malealea), Werner Weiss (AEE Intec/ SOLTRAIN), Andre Friend (Telecom Techniques), Ivan Yaholnitsky, Sehloho Holomo and Stephen Lelimo (BBCDC), and BBCDC graduates.

A cluster of technologies and social capital assembled, went to work and materialized in an orderly fashion overall. BBCDC and Telecom Techniques replaced the diesel generator with an 8.4kW solar micro-grid, and BBCDC renovated the water supply infrastructure. Once this was done, SOLTRAIN came to the fore and facilitated installation of 1 x 100 litre solar water heater (SWH), followed by 5 x 150 SWH, followed by another order for 5 x 150 SWH just 3 months later.



8.4kW PV system The success of this project is due to the professionalism and commitment of all parties involved. Malealea Lodge has resolved in the long term program to phase out all the LPG water heating equipment and replace it with SWHs. Silent clean power is now available 24/7, water quality and availability is enhanced along with pumping



Balance of system for electricity supply including water pumping



SWHs installed in guest rooms at Malealea Lodge

infrastructure, and 11 SWHs are operating daily.

Radiation conditions in Lesotho are generally excellent, and according to the manager Glen Jones, since installation of the SWHs, there was no need for back-up in the rooms equipped with SWHs after several months of operating experience.

## Bursaries for Masters Students Working on Solar Thermal Projects

by Monika Spörk-Dür & Werner Weiss

To support the aims of the SOLTRAIN project in the partner countries Botswana, Lesotho, Namibia, South Africa and Zimbabwe, and to motivate students at universities to do their masters thesis in the field of solar thermal, four students have been awarded bursaries to facilitate their research. The bursary supports travel costs to visit another institution in Southern Africa for further study or experimental work, equipment to conduct experiments to support the research and running cost of experimental work or further studies.

All of the partner countries invited students to participate in the bursary program. By the end of March 2017, 19 applications had been received, comprising four female and fifteen male students. The share in respect of countries was five applications from South Africa, eight from Zimbabwe and seven from Namibia. There were no applications from Lesotho and Mozambique. Topics submitted ranged from more theoretical studies to work on real systems and the building of prototypes. A jury evaluated the applications in terms of relevance, feasibility and budget required.

Based on the evaluation, the four students with the highest scores were awarded the bursaries. There was a good distribution concerning gender (two female and two male students) and country balance, with two students hailing from Zimbabwe and one each from South Africa and Namibia.

A report describing and illustrating the research work, including the description of

the studies undertaken and results of the research work will be available for each of the awarded research studies by the end of 2017.

In 2018 a second round for applications will take place.

#### The awarded projects are as follows:



**Gamuchirai Mutubuki** from National University of Science and Technology, Zimbabwe, is going to work on the design of a hybrid vapor absorption milk chiller

(solar and biogas) for small scale dairy farms in Zimbabwe. In this project solar thermal energy will be used for cooling the milk during the day time when there is plenty of sunlight, and biogas energy will be used at night or when there is no sunlight. The heated water will be used to run the chiller, cleaning all the dairy equipment and for the employees' bathing.

In Zimbabwe, small scale dairy farmers use firewood for pasteurization and there are poor cooling methods. Dairy equipment, specifically pasteurizers and chillers, consume a lot of energy. This project is planned to eliminate the costly energy source of the chiller and thereby reduce day to day running costs of the dairy plant. It will investigate how dairy farmers located in the rural areas can be supported with this new technological approach.



Mandlenkosi Sikhonza from the University of Fort Hare, South Africa, is going to design and monitor the performance of an innovative

residential prototype solar air source heat pump water heater. The residential solar air source heat pump water heater will comprise a heat pump unit of 0.5 kW input power, a 1 kW solar PV panel, an inbuilt inverter circuit and a 100 litre storage tank. There will also be a 24V DC battery with a charging capacity of 10 Ah. The solar air source heat pump water heater uses two sources of renewable energy, solar and aerothermal energy, to produce the desired hot water for sanitary purposes. The two electrically driven components of the system are the compressor and the fan.

The performance of the 100 litre residential

solar air source heat pump water heater under controlled simulated hot water drawn off at specific period of the day (morning, afternoon and evening) will be compared to a 100 litre flat plate solar water heater as well as a 100 litre air source heat pump water heater and a 100 litre high pressure electric geyser.



GuidenceMuchengetifrom National UniversityofScienceandTechnology, Zimbabwe isgoing to explore solarthermalintegrationopportunitiesforthe

tourism and hospitality sector in Zimbabwe. Four research areas will be selected and solar thermal surveys will be carried out. The current heating systems being used in these tourism facilities will be assessed and the hot water demand will be analysed for optimal design of the solar thermal heating system. The research will also seek to determine the breakeven points for different operating conditions for hotels in Zimbabwe.

The use of solar water heating in Zimbabwe has been largely driven by domestic installations, however there is potential in the hospitality industry, hence the need to unlock demand of solar water heating systems in the hospitality industry in Zimbabwe. The study is aimed at improving the collector area per capita for Zimbabwe.



Anna Amupolo from Namibia University of Science and Technology is going to do her research on a comparative study of solar water heater and electrical geyser in terms

of performance and financial benefits. The research work seeks to provide proof of concept that a solar water heater is a longterm investment that will save money spent on water heating after the system has paid for itself. The main objective of this research is to evaluate the economic cost of solar water heater and electrical geyser and this can be achieved by finding the present value of installing a SWH, the present value for installing an electrical geyser, the present value of saving for each system and finding the pay-back period.

This research will also evaluate the energy performance of the solar water heating system based on its long-term thermal performance and efficiency. Since it aims to promote the use of renewable energy, it will also help the consumers to choose the most efficient systems.  $\bigcirc$ 

## Data monitoring and analysis for Namibia

## by Helvi Ileka and Fenni Shidhika

SOLTRAIN has financed monitoring equipment that is now installed at four of the 62 houses equipped with solar water heating systems (SWH), and at two houses meeting their hot water requirements through electric geysers. The low cost houses low cost were constructed by the National Housing Enterprises (NHE), in Otjomuise, Windhoek. Additional monitoring equipment has also been installed at a residential house in Dorado Park and at Joe's Beer house.

Existing monitoring equipment which was installed under SOLTRAIN I at Katutura hospital has also been revived after a system refurbish in 2015, with the antenna of the modem being extended in order to alleviate data transmission problems.

The results of the data analysis of solar water heaters at NHE houses were presented at the "Revision of the Blueprint and Development of a Strategy to Guide the Implementation for the Mass Housing Development Programme", that was held at Namibia University of Science and Technology (NUST) in late March, 2017.

Two bachelors students in the electrical and computer engineering field at NUST are at advanced stages of writing up their final research projects using the NHE housing project's data.

Collected data was computed to determine the harvested solar energy, the hot water consumption, and the share of additional backup electrical consumption, and was compared to the main total consumption at the houses. The results of the computation are shown in figure 1 for all 4 houses equipped with thermosiphon solar water heaters, and two with conventional geysers.

#### Summary of the data analysis:

If a solar water heating system of the correct size is installed, no electrical backup is needed as can be seen with House 1 that used 100% solar power to heat up the water from March 2016 to February 2017. In contrast, House 2's SWH system is under-designed, resulting in the need for an additional 74 kWh to heat up the water with an electrical backup element, representing 33 % of total energy consumption.

Other information that came to light was that the hot water demand per person is between 13 and 60 litres per day, and that overall electricity demand for houses without solar systems is significantly higher than for houses with a SWH system installed.  $\diamondsuit$ 



Energy, and hot water consumption characteristics for houses in Otjomuise, Windhoek, averaged over a 12 month period (March 2016 – February 2017)

## Heat for Industry: Info Brochure and Webinar

by Bärbel Epp



Solar Payback

FOR

INDUSTRY

The first publication of the international Solar Payback Project is available. For industrial clients or political decision makers, the publication illustrates the significant potential of solar heat technologies in

manufacturing businesses, the suitable market segments and the system integration options. You can download the publication at this <u>link</u>.

The publication quotes satisfied investors of Solar Heat for Industrial Processes (SHIP) and analyses three ways to break the vicious circle of low deployment rates. Solrico is one of 12 partners in the 3-years project Solar Payback, which aims to increase SHIP deployment in Brazil, India, Mexico and South Africa. Today more than 500 investors trust solar process heat. Increasing the number of SHIP plants even further will require integration concepts to be standardised and simplified and collector field costs to be cut.

The project researchers have gone to great lengths to address these challenges and will present their key findings in a webinar titled **Solar Heating for Industrial Processes** scheduled for Thursday, 6 July 2017, from 1 to 2.30 pm GMT.

More information on the topics and the speakers can be found <u>online</u> including a link to the registration page. The webinar is organised by the IEA SHC Programme's Solar Academy and is hosted by the International Solar Energy Society.



## **SOLTRAIN Activities in June & July, 2017**

## The following activities were completed, are currently underway or will be presented shortly:

### **SOLTRAIN Namibia:**

Training Course for Experts & Professionals, 22 - 23 June at the Hotel School, Brahm Street, Windhoek

### SOLTRAIN South Africa:

Training Course for Thermosyphon Solar Water Heaters, 27 - 28 June at the CEF Building, 150 Linden Street, Sandton

Quality Inspectors - Solar Water Heating, 29 - 30 June at SEG SOLAR ENERGY (Pty) Ltd, 168 Bram Fischer Drive, Randburg

### SOLTRAIN Zimbabwe:

Training Course on Thermosyphon Solar Water Heaters, 6 - 7 July, Works & Estates Boardroom, corner Gwanda Road & Cecil Avenue, Bulawayo

## SOLTRAIN

The Southern African Solar Thermal Training & Demonstration Initiative is a regional initiative on capacity building & demonstration of solar thermal systems in the SADC region. It is funded by the Austrian Development Agency & cofunded by the Opec Fund for International Development.

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