



# Introducing Solar-Powered Refrigerators in Southern Africa

## Background

The name SolarChill stands for an environmentally friendly refrigeration concept developed under a partnership between Greenpeace International, United Nations Environment Programme (UNEP), Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH-Proklima, Danish Technological Institute (DTI), United Nations Children's Fund (UNICEF), World Health Organization (WHO), Programme for Appropriate Technology in Health (PATH), Danfoss, and Vestfrost over the past 10 years. The original idea was to provide medical stations in rural areas away from the electricity grid or with intermittent power supply with reliable cold storage to keep vaccines fresh. This is an essential service which currently requires the use of kerosene refrigerators or electricity generators running on gasoline or diesel.

The SolarChill refrigeration system operates on and stores solar energy directly in the form of ice. It requires no (heavy metal) batteries and uses ozone- and climate-friendly hydrocarbons as refrigerant. Because of the solar panels it is possible to use this equipment in remote areas without connection to the electricity grid. In a next step, a second model, an upright refrigerator was designed which could be used for general refrigeration needs in rural health stations or even for commercial or private purposes.

During field testing it was discovered that the prototypes could only perform well in modest temperatures of around 30°C. This was not yet sufficient for very hot climates of over 40°C, a common condition in the hot seasons of many tropical and subtropical countries. At that stage, funding for further development unfortunately ran out and this very progressive concept was left unfinished.

## Project Description

In cooperation with its African partner (the company Palfridge in Swaziland) and the Technical University (TU) Dresden, GIZ works along the objectives of the SolarChill concept to develop out of Africa sustainable solutions bringing much needed affordable vaccine supply to regions without grid connection and affordable refrigeration solutions powered by renewable solar energy. The main purpose of the project is to complete the technical development of the existing prototypes to make the SolarChill concept suitable for use in temperatures over 40°C. The new prototypes include the original vaccine cooler (operating between 2°C and 8°C) for rural health services and modifications in the form of a chest freezer and an upright single door refrigerator which can also be used in households and for commercial purposes. The fridges have a holdover time over several days to sustain cloudy periods. The project includes also support for the set-up of a production line at Palfridge to provide initial manufacturing capacity and to study the economics of the production and marketing of this sustainable technology. One aim is to provide the models at a competitive price which will be necessary to ensure a wide distribution in rural areas without access to the electricity grid. The other is that the experiences gained in this project will be adopted and replicated by further refrigeration manufacturers in and outside Africa.

On behalf of



Federal Ministry for the  
Environment, Nature Conservation  
and Nuclear Safety

of the Federal Republic of Germany



## Project Impact

Conventional refrigeration equipment is produced with approx. 0.13 kg of HCFC-22 or HFC-134a in their cooling circuits. The SolarChill equipment will run without these fluorinated refrigerants and can operate without heavy metal and acid batteries. It is therefore contributing to ozone layer and climate protection and reducing toxic waste. The produced equipment is designed to substitute conventional technology in rural areas. As such, every unit sold will contribute to a sustainable and permanent reduction of direct greenhouse gas emissions. Currently available models using HCFC or HFC produce direct, refrigerant based emissions of approx. 0.2 tonnes of CO<sub>2</sub> equivalent per unit during lifetime usage. The solar refrigerators with natural refrigerants have zero or close to zero direct emissions. Through the substitution of fossil fuel generated power with renewable energy power, indirect emissions of approx. 5 tonnes CO<sub>2</sub> can be avoided over the lifetime of a single refrigerator.

The project contributes to improved health services of rural populations by ensuring the availability of appropriately stored high quality vaccines in off-grid areas. It also helps to provide better overall living conditions and increased comfort by offering capacities for hygienic food and cold drinks storage in shops and at home.

It is predicted that solar refrigeration will become fully competitive with the continuously decreasing prices for solar panels. Households will enjoy net savings as they can avoid costs with their electricity bills. The technology operates without the need to purchase and transport fossil fuels over sometimes long distances.

The SolarChill technology is not patented and is free to use for anybody. The project also assists in the dissemination of this technology thereby stimulating a South-South technology transfer. Already now, several other countries in the South African region and beyond have expressed interest in adapting the technology and are considering investing in domestic production of SolarChill.

Further information/media interest: The German television Deutsche Welle (DW-TV) has produced a short film about this project, available on their website: [www.dw-world.de](http://www.dw-world.de) or on the Proklima website.

### Title SolarChill Project

Country Southern African region

Sector Refrigeration

Objective Introduction of solar refrigeration in Southern Africa

Target Group Environment and health ministries in Southern Africa; local health centres; refrigeration technicians, traders and producers; small shops; off-grid households

Project Executing Organization BMU (German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety)  
Implementing Partner Organization Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH; National Ozone Unit Swaziland; Palfridge

Project Approval October 2008

Project Duration Until April 2012

Project Budget EUR 2,059,771

Funds The project is funded by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety within the framework of the International Climate Initiative based on a decision of the German Federal Parliament.

### Impact on Climate Protection

Every operational SolarChill unit avoids direct refrigerant emissions of approx. 0.2 tonnes CO<sub>2</sub>eq per unit during lifetime usage. Additionally, indirect emissions of 5 tonnes CO<sub>2</sub> per unit during lifetime usage can be avoided from electricity generation in comparison to currently used technology.

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