SolarChill - Development, Testing and Technology Transfer

SolarChill Project Background

Over 1 billion people live in regions without reliable electrical supply. In those regions maintaining a secure "cold chain" for preserving vaccines, medicines and food supplies is extremely challenging. Lack of reliable refrigeration results in extensive food, medicine and vaccine spoilage.

The SolarChill project was launched in 2001 by a unique consortium of several major international organizations to develop and deliver affordable, technically reliable, climate friendly, solar powered and lead acid battery free refrigeration to regions with insufficient electricity.

The SolarChill project partners today include: Danish Technological Institute (DTI), German Government Development Agency (GIZ) GmbH, Global Environment Facility (GEF), Greenpeace International, HEAT GmbH, Programs for Appropriate Technologies in Health (PATH), Swiss Resource Centre and Consultancies for Development (SKAT), United Nations Environment Programme (UNEP), United Nations Children's Fund (UNICEF) and the World Health Organization (WHO).

The SolarChill project partners have no commercial interest in the Project. Their sole mandate is to develop this public domain technology, make it freely available to interested manufacturers worldwide, and promote its uptake internationally. This long-lasting partnership of diverse organizations has collectively guided the project along since its inception.

Solar Chill Direct Drive (SDD) Technology

The SolarChill project successfully pioneered the development of solar direct drive (SDD) technology.

Solar power from solar panels run a direct drive compressor. The compressor runs the refrigerant cycle which in turn produces an ice bank that maintains the required temperature in the cabinet. The power of the sun is essentially stored in an "ice battery". It is basically a contemporary solar version of the old-fashioned ice box.

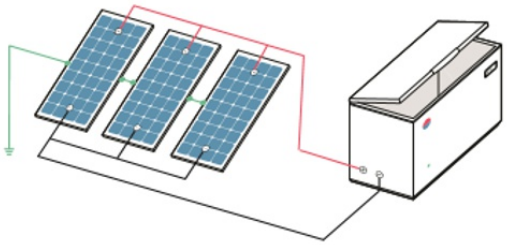

Fig. 1: SolarChill system set up

A thermostat maintains the units at the required temperatures. The mandatory temperature range for vaccines is between 2 and 8° Centigrade, day and night. The optimum temperature range for perishable food storage is 3 to 5° C.

In low-sun situations, or with power completely disrupted, the thick insulation of the cabinet maintains acceptable temperatures for more than 75 hours. The thickness of the insulation varies according to the ambient temperature for which the specific SolarChill units are designed.

Environmental benefits of SolarChill

SolarChill addresses four environmental challenges: (a) harnessing renewable solar energy to meet human needs; (b) eliminating ozone depleting and potent global warming substances, specifically HCFCs and HFCs; (c) eliminating reliance on fossil fuels such as kerosene; and (d) eliminating the use of toxic lead acid batteries.

Commercialization of SolarChill

SolarChill Vaccine and Medicine Coolers (SolarChill A)

Currently, in 2017, there are approximately 15,000 to 20,000 SolarChill vaccine coolers installed in health facilities around the world (Africa, Asia, Latin America, Caribbean).

SolarChill A units are also used in human made and natural disaster areas: such as war-zones, areas hit by earthquakes and tsunamis. For example, SolarChill A units have been installed in refugee camps in Chad and Sudan, and earthquake damaged zones in Haiti.

The SDD vaccine coolers are proving to be more reliable and cost effective than other off-grid vaccine cooler technologies, and solar direct drive vaccine coolers are rapidly becoming the technology of choice of Ministries of Health.

Fig. 2: SolarChill Type A

Fig. 3: SolarChill Type B

SolarChill Food Refrigerator (SolarChill B)

SolarChill food refrigerator, for domestic and small commercial refrigeration, is not yet on the market. It is to be laboratory and field tested in 2018, with the intention of it being commercialized soon after.

The SDD food refrigerator has vast market potential as it can be used for domestic and small commercial applications in developing countries, as well as for off the grid recreational purposes in developed countries.

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GEF Funding for SolarChill Demonstration and Technology Transfer Projects

With funding from the Global Environment Facility (GEF) the SolarChill Project is currently (2017-2019) implementing the "SolarChill Commercialization and Transfer Projects in Colombia, Swaziland and Kenya."

The aims of the GEF SolarChill Projects are threefold: (1) To conduct large scale tests of the SDD vaccine refrigerators through field evaluation of technical performance and user acceptance; (2) To stimulate the development of SDD food refrigerators and to laboratory and field test the prototypes; and (3) to encourage the market uptake of SDD technology in developing countries.

Case Study - Kenya

In close collaboration with the Ministry of Health of Kenya and the Christian Health Association Kenya (CHAK) more than 35 off-grid health facilities, in 25 counties, were selected for the installation of SolarChill vaccine refrigerators. The different sites will allow for the monitoring of the units under varying climatic conditions.

Fig. 4: SolarChill Type A arriving on site in Kenya

The Project will train Kenyan technicians in the safe installation and maintenance of the systems.

As the majority of rural households and communities in Kenya can not afford refrigerators, microfinance options are being explored with Kenyan stakeholders. It is expected that through economy of scale and eventual domestic manufacturing, the costs of the SolarChill refrigerators will significantly decrease.

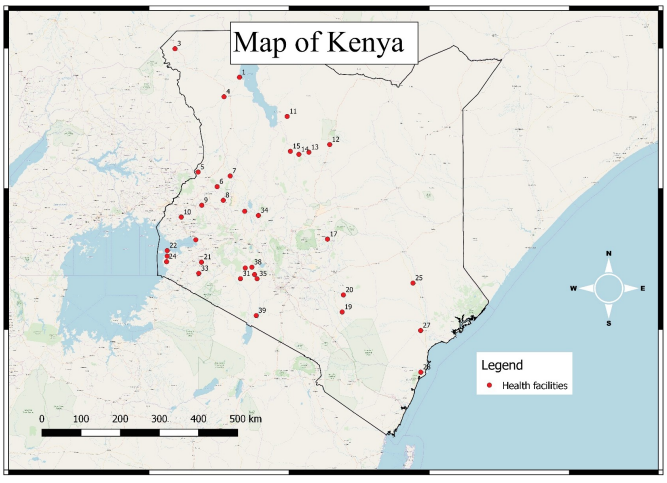

Fig. 5: Map of selected sites in Kenya

Summary

SolarChill Project demonstrates that environmentally sustainable, off the grid refrigeration is technically and commercially feasible.

Furthermore, SolarChill offers expanded market opportunities for appliance manufacturers and thus provides added incentives for the conversion of existing plants from potent global warming fluorocarbons to natural refrigerants.

Installation and maintenance of SolarChill units requires training of local technicians. The SolarChill Project thus enhances the development of a skilled cadre of technicians that can work with natural refrigerants and solar electricity.

SolarChill has additional potential. Some manufacturers are in the process of developing energy harvesting technologies to utilize the excess energy from the SDD units for other applications, such as charging of cell phones and lighting.

The SolarChill Project bridges health, development and environmental issues. SolarChill demonstrates that health, environment and poverty issues are inextricably interrelated and can be tackled together.

The SolarChill Project welcomes enquiries from interested agencies and companies.

Please see **www.solarchill.org**

General Project Information

Project Title: SolarChill Development, Testing, and Technology Transfer Outreach

Countries: Colombia, Kenya, Swaziland

Funding Agency: Global Environment Facility (GEF)

Implementing Agency: UN Environment

Executing Partners: SKAT Foundation, supported by UNICEF, HEAT GmbH, Greenpeace International, Danish Technological Institute (DTI)

Project Duration: 2016-2018

Project Summary: To commercialize and transfer the SolarChill vaccine refrigerator (SolarChill Type A) and to begin the process of commercializing and transferring the SolarChill household and light commmercial refrigerator (SolarChill Type B)

Target Groups: End users of refrigeration systems, health centres, hospitals, domestic households in off-grid regions, small commercial food centres

Project Focal Areas: Climate Change, Human Health

Overall Project Budget: 2.200.000 USD

Contact: www.solarchill.org

Project Partners and Implementing Agencies

GLOBAL ENVIRONMENT FACILITY
INVESTING IN OUR PLANET
GREENPEACE
HEAT
DANISH TECHNOLOGICAL INSTITUTE
World Health Organization
PATH
unicef
skat Swiss Resource Centre and Consultancies for Development
giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH