



INSTALLING AND TESTING BATTERY-FREE SOLAR REFRIGERATORS IN VIETNAM

OPTIMIZE



World Health
Organization



This booklet contains photographs of the installation and initial testing of two True Energy BLF 100 DC Sure Chill[®] vaccine refrigerators in Vietnam. The refrigerators were installed in May 2011, one in Thanh Ba district, Phu Tho province and the other in Thanh Phu district, Ben Tre province.

The photo set accompanied an article on vaccine refrigerators in the April 2012 edition of Op.ti.mize, an electronic newsletter on the vaccine supply chain. You can view an archive of all Op.ti.mize newsletters here:
www.path.org/projects/project-optimize-newsletter

For more information on project Optimize:
www.path.org/projects/project-optimize
www.who.int/immunization_delivery/optimize



1. Loading vaccine refrigerator and phase change material at Hai Phong port

Traditional solar refrigerator systems use batteries to store the sun's energy for the night and cloudy periods. However, problems with battery maintenance have made solar refrigeration a challenge in many low-resource settings. To address the battery problem, refrigerator manufacturers have created a new category of solar refrigeration that eliminates the need for an energy-storage battery. Vietnam has piloted this battery-free solar refrigeration system to evaluate it as a vaccine storage solution, especially in areas where electricity is limited.



2.

Loading vaccine refrigerator and solar equipment onto a truck at Hai Phong port

Two Sure Chill® battery-free solar vaccine refrigerators were shipped to Vietnam for distribution to health centers in Thanh Ba and Thanh Phu districts.

Photo: PATH/
Hai Le



3.

Installing the vaccine refrigerator | Thanh Ba district, Phu Tho province

The vaccine refrigerators were installed with technical support from from UK-based manufacturer, True Energy.



4.

Filling the vaccine refrigerator with phase change material | Thanh Ba district, Phu Tho province

Once installed, PATH and the National Expanded Programme on Immunization (NEPI) monitored each refrigerator's temperature to ensure it performed appropriately for vaccine storage.



5.

Transporting solar panel for vaccine refrigerator | Thanh Ba district, Phu Tho province

Solar equipment was installed at both sites by technicians from a solar power company based in Ho Chi Minh City.

Photo: PATH/
Kien Vu



6.

Solar panels on roof of health center prior to installation | Thanh Ba district, Phu Tho province

In both sites, solar panels were installed on the roof where the solar exposure would be unobstructed year round.

Photo: PATH/
Ken Vu



7.

Installing solar panels | Thanh Ba district, Phu Tho province

Professional installation by experienced technicians is one of the keys to successful and sustainable solar vaccine refrigerator systems.

Photo: PATH/
Kien Vu



8.

Solar panels installed on roof | Thanh Ba district, Phu Tho province

Solar panels are installed at an angle calculated to optimize exposure to the sun throughout the year, using supports that are designed for maximum expected wind force.

9.

Temperature and voltage data loggers | Thanh Phu district, Ben Tre province

Data loggers were installed to measure temperature at different locations inside the refrigerator, temperature outside the refrigerator, solar energy collected by the solar panels, voltage generated by the solar panels, and current drawn by the refrigerators.

Photo: PATH/Hai Le





10.

Testing with water bottles | Thanh Ba district, Phu Tho province

Health workers tested the refrigerators using water bottles to simulate the thermal mass of vaccines, monitoring the temperature daily and opening the refrigerator to simulate receiving and distributing the vaccine on a particular schedule.



11.

Battery-free solar vaccine refrigerator | Thanh Ba district, Phu Tho province

An external thermometer shows the temperature inside the refrigerator. Here the refrigerator is shown after installation as it is cooling down from room temperature. It will stabilize between 4 and 5 degrees Celsius.



12.

Data logger surrounded by water bottles in vaccine refrigerator | Thanh Phu district, Ben Tre province

Data from temperature and solar energy loggers showed that the Sure Chill can maintain correct temperature even over two weeks of very low solar radiation.



13.

Assembled and functional battery-free solar vaccine refrigerator | Thanh Phu district, Ben Tre province

Lessons learned during the demonstrations in Vietnam resulted in numerous improvements to the Sure Chill refrigerator that will also benefit future users in other countries.

Photo: PATH/
Hai Le



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This photo book is available online: <http://flic.kr/s/aHsjz4131g>
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