



## 25,000 Solar Roofs for Mexico

### Initial situation

Mexico ranks thirteenth internationally in the emission of greenhouse gases (GHGs). One of the key challenges in reducing these emissions is to encourage greater use of renewable energy technologies in the residential sector. Around 80% of households in Mexico use some form of fossil fuel for cooking and heating water, which constitutes a major source of greenhouse gas emissions. One of the most technically viable and economically attractive options to reduce fossil fuel consumption in home systems is solar water heating (SWH). Although Mexico has one of the highest averages for solar irradiation in the world, its potential remains largely untapped. Currently, few households have a solar collector, despite sharp rises in gas prices and the quick amortization of investments in solar water heaters (3-5 years).

In 2007, the Mexican Energy Efficiency Agency (CONUEE) presented a program for the dissemination of solar water heaters. A key factor of the program was the fact that, for the first time, the activities carried out by a large number of public and private actors were bundled together. This one-of-a-kind program included a long-term holistic approach to address market development, including aspects related to market regulation, quality standards, incentives for consumers, reduction of information deficits and professional qualification.

### Project approach

In 2009, the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) commissioned Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) to develop the project “25,000 Solar Roofs for Mexico”. Implemented by the International

Climate Initiative (IKI), the project aimed to increase the use of solar water heating systems in the Mexican residential sector, thereby reducing GHG emissions.

The project was based on the Market Incentive Program that had already been implemented for several years in Germany. Its main objective is to promote and encourage the use of renewable energy sources and to remove barriers that inhibit their use. The concept was adapted to the Mexican context by developing a mortgage facility called *Hipoteca Verde* managed by the Institute of National Housing Fund for Workers (INFONAVIT) with a combined grant from foreign funds. With the introduction of this innovative model, Mexico positioned itself as a pioneer in the field.

Through this project, INFONAVIT granted a loan for the purchase of SWH to generate savings in water and energy consumption.

*Hipoteca Verde* had impacts on both quality and price of equipment. When the project began, two different technologies for SWH were available in Mexico: flat plate collectors at an average price of USD 734, and evacuated tube collectors at an average price of USD 395. Prices of flat solar collectors decreased due to economies of scale to USD 450, the price of tube collectors increased to USD 450 due to higher requirements regarding the quality of equipment.

The project has enabled Mexico to take better advantage of its huge potential of solar energy and thus boost the market for SWH. In particular, it aimed to:

- generate savings for both families (reduced consumption of gas) and the government (reduced subsidies);
- provide access to a proven, clean and highly profitable technology for low-income population;

- strengthen the Mexican production capacity and services;
- contribute to the implementation of the Special Climate Change Program of the Federal Mexican Government.

## Project implementation

Between 2010 and 2012, a total of 19,013 SWH were subsidized. The installed equipment will help to reduce at least 146,711 tCO<sub>2</sub>e over the technical lifetime of the equipment (15 years) as well as to reduce the consumption of liquefied petroleum gas (LPG) in households. In terms of GHG emission reduction, each SWH contributes 0.57 tCO<sub>2</sub>e/year, as an average, with a life cycle of 15 years associated to SWH. The subsidies granted by the project triggered financing and installation of about 161,000 SWH through the program in all states of the country during the period 2007-2013.

The investments made during the execution of the project amounted to EUR 3.1 million (EUR 1.9 million in form of direct subsidies and EUR 1.2 million through technical assistance), and are expected to result in a total of EUR 24 million worth of savings for users of SWH and EUR 700,000 from avoided subsidies for the Mexican Government during the lifetime of the equipment. Each user is expected to save about USD 100 per year due to the reduction of the gas bill. Furthermore, the installation of just over 161,000 additional SWH by *Hipoteca Verde* (without German subsidies) is expected to result in savings of about USD 230 million for end users of SWH over 15 years; moreover a significant CO<sub>2</sub> emission reduction of about 1.25 million tons is expected.

Additionally, the installed SWH represent a clean and highly profitable technology which increases the value of the houses of the target group.

## Lessons learned and results

As part of the project implementation, GIZ conducted four field evaluations between 2009 and 2012, to verify the quality of more than 3,300 SWH installations in benefi-

ciary households. This allowed the establishment of a quality baseline for both the project and INFONAVIT.

The most representative results of these evaluations are summarized below:

- The quality of the equipment and its installation is key to assure proper functioning of SW systems.
- Deficiencies in installation affect system performance with direct consequences in expected savings, payback periods and maintenance needed.

## Technical installation standards

With the participation of public and private actors, a technical group was formed in early 2012 to develop a standard installation process for SWH. As a result, the Occupational Competency Standard EC0325 was officially published in May 2013, focusing on the training and certification of SWH installers. ([http://conocer.gob.mx/publicaciones\\_dof/EC0324.pdf](http://conocer.gob.mx/publicaciones_dof/EC0324.pdf)). As a result of this activity 200 installers in 11 Mexican states were trained and certified.

## Centralized SWH system pilot project

In its second and final phase, the project focused on promoting the use of SWH in other housing segments, such as existing housing and multi-story housing. A demonstration project was developed to identify minimum requirements and criteria for the evaluation of technical and financial proposals of centralized SWH systems in multi-story housing. Based on the experiences gained from the demonstration project, GIZ developed a financing concept that was adopted by *Sociedad Hipotecaria Federal* (a federal mortgage bank), which plans to implement a program for financing SWH in multi-story housing. The project contributed to a rapid growth of the SWH market, thereby emphasising the importance of quality, not only with regard to the equipment but also with regard to its installation, to ensure that end users receive all the benefits associated with this technology. This triggered the development of a new market for specialized technicians with certified capabilities in SWH installation.

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## Imprint

**Published by:** Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit (BMUB)  
 Referat KI III7 · 11055 Berlin  
 E-Mail: [KIII7@bmub.bund.de](mailto:KIII7@bmub.bund.de) · Internet: [www.bmub.bund.de](http://www.bmub.bund.de)  
**Design:** MediaCompany – Agentur für Kommunikation GmbH  
**Photo credit:** Christian Palma  
**Date:** September 2015

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