

SWRES International Programs Overview

**New Mexico State University
College of Engineering**



**Southwest Region Experiment Station
Southwest Technology Development Institute**

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Why International?

◆ Ideal Market for Renewables

- >2 billion persons without electricity - RE market needs >US\$60 trillion
- >1.1 billion persons without potable water - RE market needs >US\$20 trillion

◆ U.S.PV industry's driven by export sales (>70%);

◆ U.S. industry is continuing to lose ground in international markets as foreign competitors and governments become more active;

- Foreign governments use protectionist trade practices
 - Direct subsidies
 - Tied aid (Japan, Germany, Spain, France, etc.)
 - Custom duties
 - Develop codes and standards (that leave out U.S. practices)

◆ U.S. government and industry must stay engaged overseas to remain competitive;

◆ U.S. needs to become MORE involved overseas or U.S. industry loses out.



SWRES International Program Objectives

- ◆ Assist U.S. industry with overseas market development;
- ◆ Support DOE international program activities;
- ◆ Create competitive advantage for U.S. industry (e.g., codes);
- ◆ Develop new solar technology applications;
- ◆ Promote integrated development programs;
- ◆ Develop QUALITY system design and installation practices;
- ◆ Create LOCAL interest and project ownership;
- ◆ Train industry and project developers;
- ◆ Develop LOCAL maintenance infrastructures;
- ◆ Monitor system performance and reliability; and,
- ◆ Develop long-term market sustainability.
- ◆ Leverage Funding with Multilateral Organizations
- ◆ Social development, health, and poverty alleviation



SWRES Integrated Development Approach

◆ Integrated Development Approach

- Create Sustainable Markets;
- Nurture Solid In-Country Partnerships;
- Conduct Joint Strategic Planning;
- Promote Rural Development;
- Provide In-Country Capacity Building;
- Conduct System Monitoring and Feedback;
- Evaluate Results and Make Adjustments;
- Provide Follow up Support.



SWRES International Competencies

- ◆ Program Development and Implementation
- ◆ Technical Assistance
- ◆ Multilingual Training (Spanish and Portuguese)
- ◆ Systems R&D, Testing
- ◆ Applications Development
- ◆ Performance Monitoring
- ◆ Business and Market Development
- ◆ Codes and Standards
- ◆ Program Leveraging
 - Nearly half of total SWRES funded activities since 1992
 - ~40% of international activities funded from outside DOE contract
 - Winrock, IIE, USAID, NASA, NAFEC, World Bank, Sandia, NREL, EPA, etc.



SWRES International Training



Mexico

Bangladesh

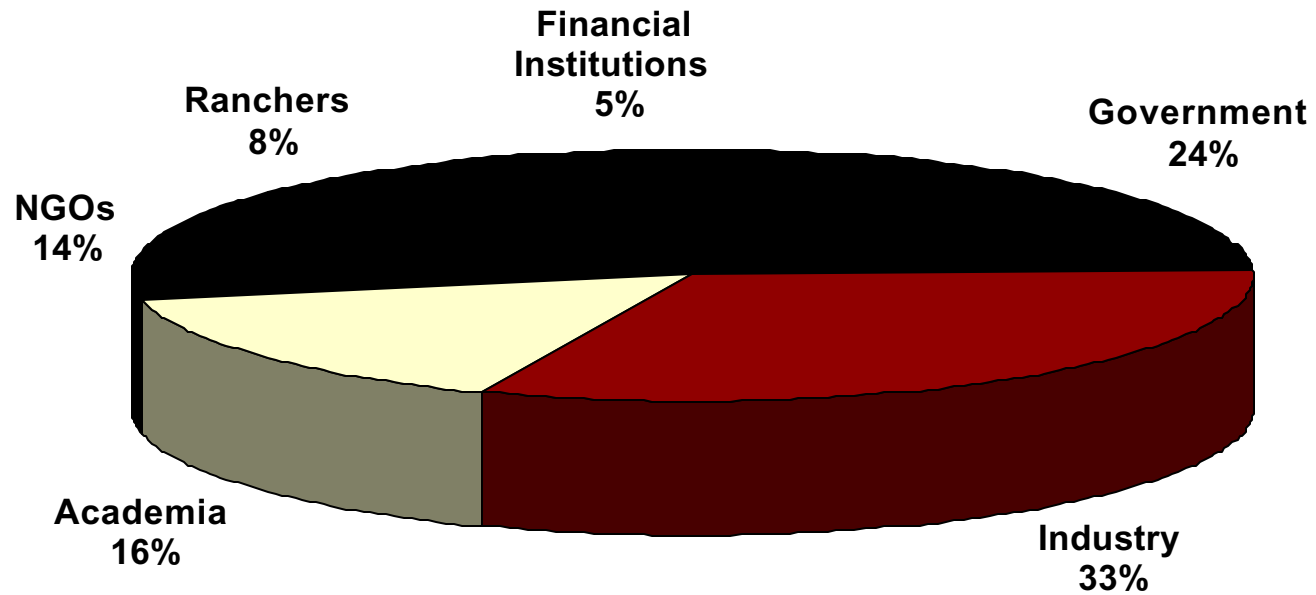
South Africa

Brazil

- ◆ Over 150 workshops and seminars in 20 countries since 1992;
- ◆ Over 5,500 participants representing more than 250 institutions and companies;
- ◆ Facilitating U.S. industry global entrée with participation by over three dozen U.S. solar and wind energy companies;
- ◆ Training of 23 FIRCO trainers for Mexico who have carried out 50+ trainings since 1999 in 28 Mexican states;
- ◆ Led to more than 500 USAID installed projects and > 2,000+ multilateral funded projects in Latin America; and
- ◆ High degree of **NEW** renewable energy adoption
- ◆ Acceptance of U.S. Norms and standards (e.g., UL, NEC).
- ◆ New Training Materials (41 Workshop Guidebooks, CD-ROMs)



Institutional Breakdown for Training in Mexico

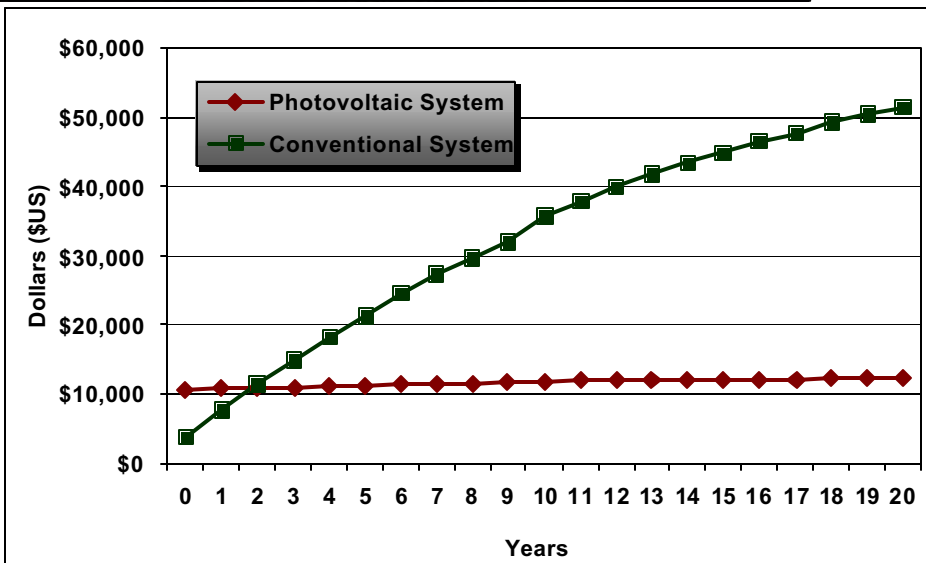


Photovoltaic Water Pumping

El Jeromin, Chihuahua, Mexico



- ◆ Livestock
 - ◆ Community Water Supply
 - ◆ Mexico
 - >250 USAID Installations
 - >300 FIRCO Installations
 - Additional 400 FIRCO/GEF installations underway and 500 more planned
- Simple Payback in <3 years compared to diesel gen**



Potable Water with Solar

◆ Partners

- EPA
- El Paso Solar Energy Assoc
- Mexican Foundation for Rural Development
- State of Chihuahua
- State of Texas



◆ Technologies

➤ Solar Distillation

- Texas
- New Mexico
- Chihuahua
- San Luis Potosí

➤ PV UV

- San Luis Potosí

➤ PV Mixed Oxidants

- Texas
- Chiapas

Renewables for Protected Areas

- ◆ >70 Solar and Wind Projects in Protected Areas in Mexico under MREP
- ◆ USAID/DOE Nov 2002 Training in Quintana Roo for Central America
PAM

- Guatemala
- Nicaragua
- Panama



**11.2 kW PV system for Montes Azules Biosphere Reserve
research station in the Lacandon jungle of Chiapas, Mexico**



New Applications: PV Ice-Making and Refrigeration

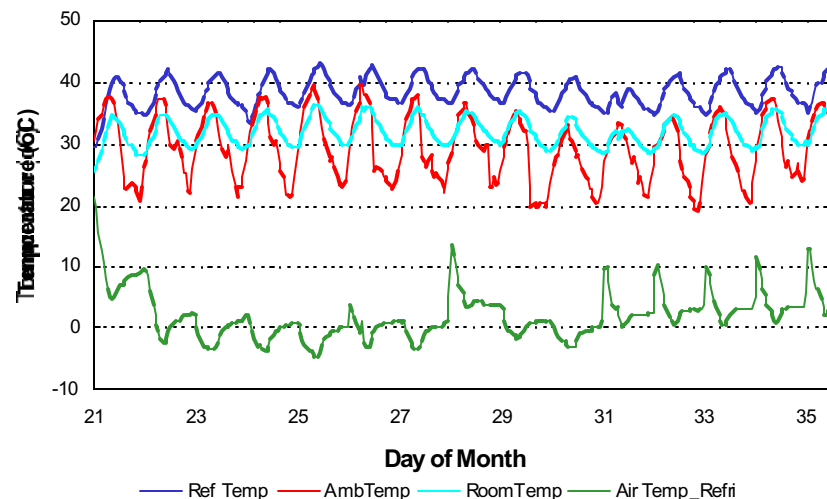
Chihuahua Tarahumara Indian School



- ◆ World's First PV icemaker with SunWize in Chihuahua 1999
- ◆ Joint development of PV refrigerator with NASA & SunDanze Refrigeration
 - 2002 Pilot Units in:
 - Mexico (2)
 - Guatemala (1)
 - Navajo Reservation (1)

SunDanze direct drive PV refrigerator
Ice storage runs on 90Wp and
Costs 3 times less than battery
refrigeration approach

Solar Refrigerator
Temperatures: July 2000



PV Power for Rural Schools

- ◆ 54 PV powered schools with EDUSAT in Chihuahua in 2002
- ◆ 3 PV schools in Guatemala
- ◆ 4 PV schools in Honduras
 - Over 3,000 non-electrified schools
 - IDB follow-up program for 100 more schools



◆ Improved Technology Concepts

- 150 Quality PV Lighting Systems in Chihuahua with SunWize/ENSO

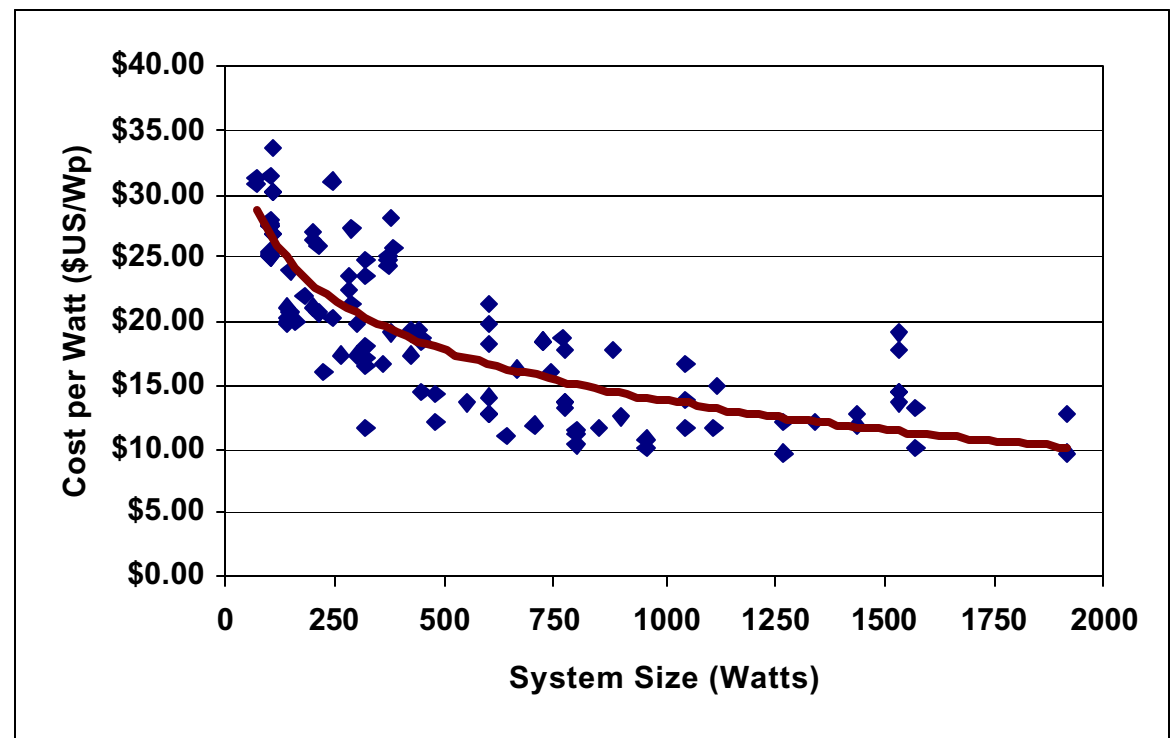


New Development Models for Mexico: Financed Quality PV Systems in Chihuahua



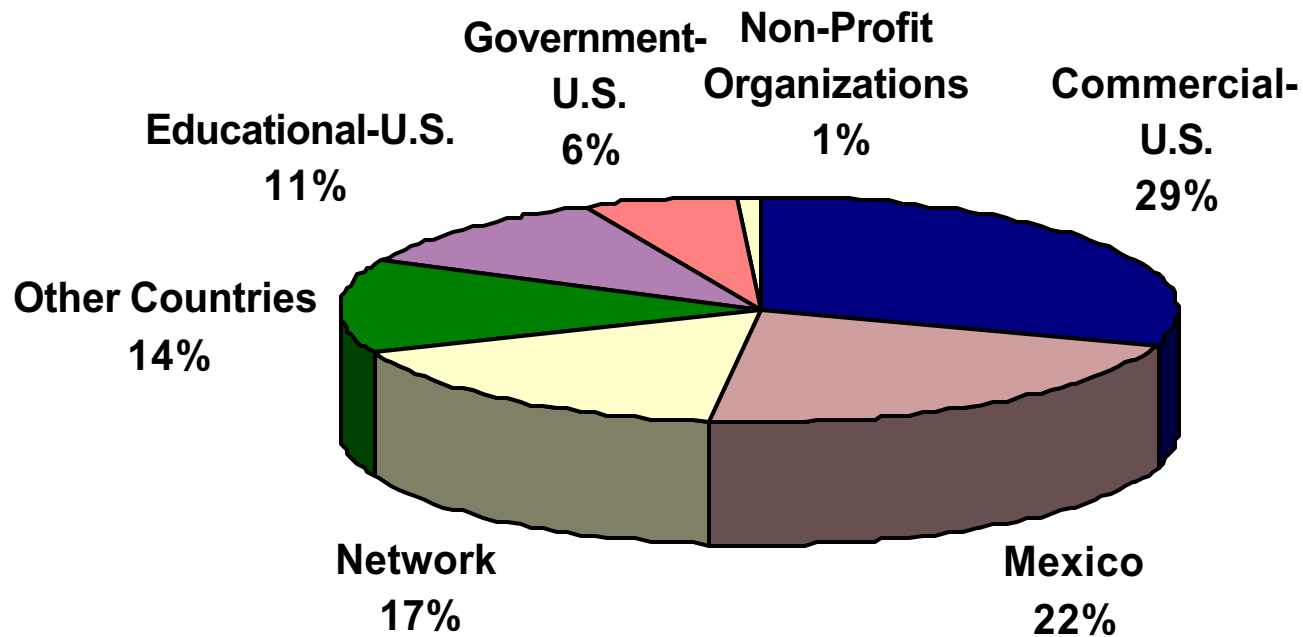
- ◆ \$100k USAID Financing Fund Used to Leverage Additional \$200+k since 2000
- ◆ >250 Chihuahuan PV lighting systems financed (60% installed by ENSO - SunWize)
- ◆ >25 PV water pumpers financed
- ◆ 1 PV communication financed

- ◆ Evaluate technical, social, and economic impacts
- ◆ Evaluate costs
- ◆ Rate overall effectiveness of development programs
- ◆ Feedback to industry on performance
- ◆ Assist USAID with documentation



PV Water Pumping Systems Costs in Mexico

SWTDI International Website Statistics



- ◆ 15-25,000 visitors each month
- ◆ U.S. is >46% of web traffic
- ◆ >29% of traffic is from industry
- ◆ Mexico is >22 % of web traffic

SWRES International Publications since 1992

◆ **Newspaper Articles:**

- 28 in USA, Mexico, Ecuador, Honduras, South Africa, Bangladesh, Chile, Guatemala, Dominican Republic, Bolivia, Brazil, etc.

◆ **Published Conference Proceedings**

- 42 for ISES, ASES, ANES, IEEE, SEIA, ASHRAE, NCPV, ASME, World Bank, etc.

◆ **Technical Reports**

- 31 for Sandia, NREL, NASA, ASES, World Bank, EPA, DOE, industry, etc.

◆ **Project Reports**

- 24 for Sandia, NREL, IIE, Winrock, USAID, World Bank, NAFEC, USIS, etc.

◆ **Workshop Manuals, Training Guides, and CD-ROMs**

- 41 for Sandia, NREL, ANES, Winrock, IIE, World Bank, REFAD, etc.



SWRES International Crosscuts Domestic Activities

- ◆ **MREP as Model Basis for Sandia Navajo PV Program**
- ◆ **International Wind Training Model Utilized for Native American Wind Training Program (NREL WEATS)**
- ◆ **PV Refrigerator Development**
 - SunDanze PV Refrigerators for Navajo Reservation
 - SunDanze Partner Enlisted for Domestic PV Semi-Trailer Refrigerator Development
- ◆ **U.S. NEC and PV Codes for Foreign Countries**
 - Competitive Advantage for U.S. Industry
- ◆ **Reliability Database**



2003 SWTDI International Key Support Activities

◆ Key Areas that SWRES will support in 2003

➤ Central America

- PV Schools in Central America
 - **World Bank COHCIT/IDB US\$10+ million program for Honduran rural schools**
 - **Guatemala with Fundación Solar**
- RE for Protected Areas in Central America and Mexico
- NRECA PV Codes Workshops in Central America

➤ Mexico

- GEF/FIRCO US\$31 million renewables for ag program
- SEP US\$1 million rural telesecundarias electrification

➤ Philippines

- USAID/Winrock/GOP US\$10+ million program

➤ Brazil

- US\$16+ million PRODEEM PV rural electrification program

