Solar Energy Guide

February 28th, 2018

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A University in Worcester, Massachusetts, United States focused in Engineering and Sciences

Our Project

Project Goal: To work with la Cámara de Industria de Costa Rica to create an online guide to educate Costa Rican companies about photovoltaic solar systems to promote self-generation.

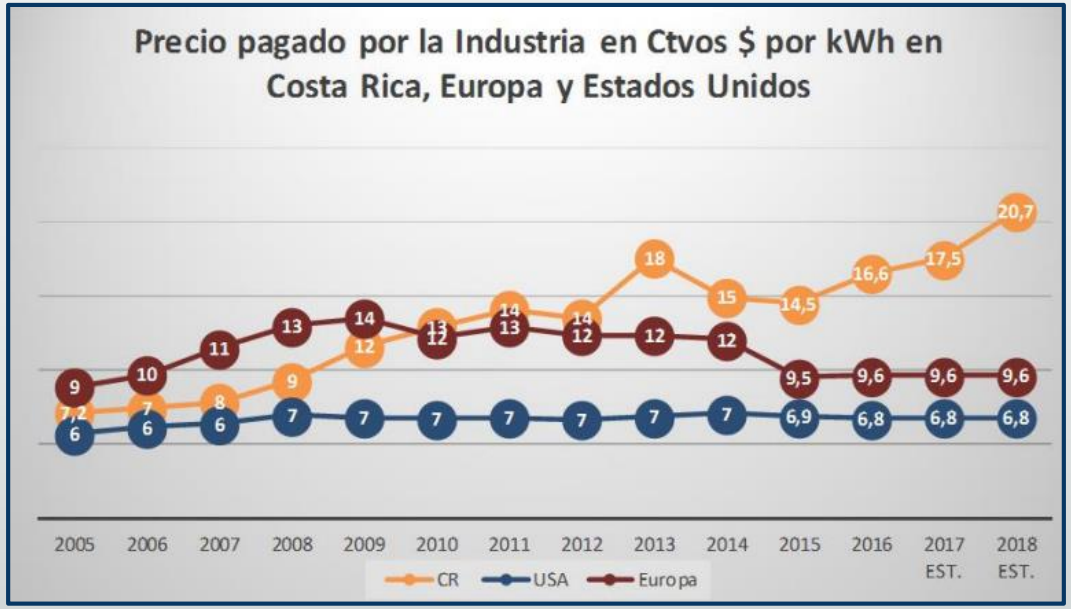
The Purpose of the Project

The Problem

High industrial energy prices

The Solution

Use solar power to help industries save money through self-generation



Obstacles of Solar Energy Usage

Scattered Information

Confusing Regulations

Inaccurate Price Data

Our Guide

- Centralized Information
- More Accurate Estimates
- Quick and Easy to Read

Objectives

Objective 1

Obtain a better understanding of the production and distribution of energy within Costa Rica

Objective 2

Create a profile of solar panel providers in Costa Rica

Objective 3

Create case studies of companies that have successfully implemented solar energy

Objective 4

Renewable Energy Guide

Objective 1

Obtain a better understanding of the production and distribution of energy within Costa Rica

- Tariffs and Regulations
- Interviews with various contacts
- Obstacles for solar panel providers and users

Taxes and Regulations

Importation Taxes:

- **General Sales Tax** - 13%
- **Law 6946 Tax** - 1.13%
- **Variable Tax**
  - 36% for Li-Ion batteries

Installation Regulation:

- **Availability (15%)**
- **Feasibility and Design Approval**
- **Commission**
- **Inspection (not always required)**

49% Rule and Access Tariff

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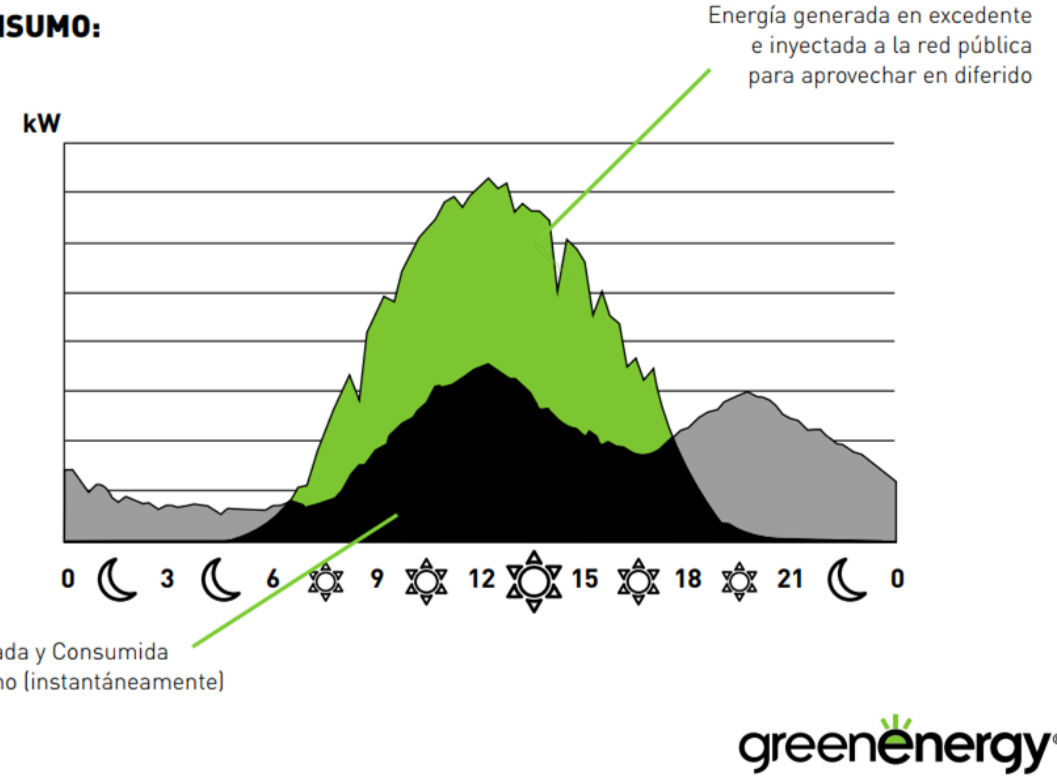

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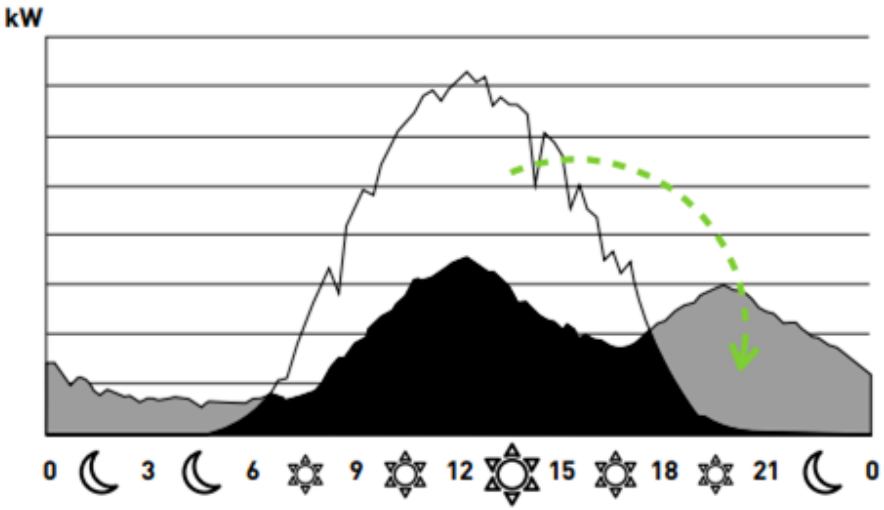
MEDICIÓN SENCILLA:



Compensación de
Consumo mediante
Medición Neta Sencilla

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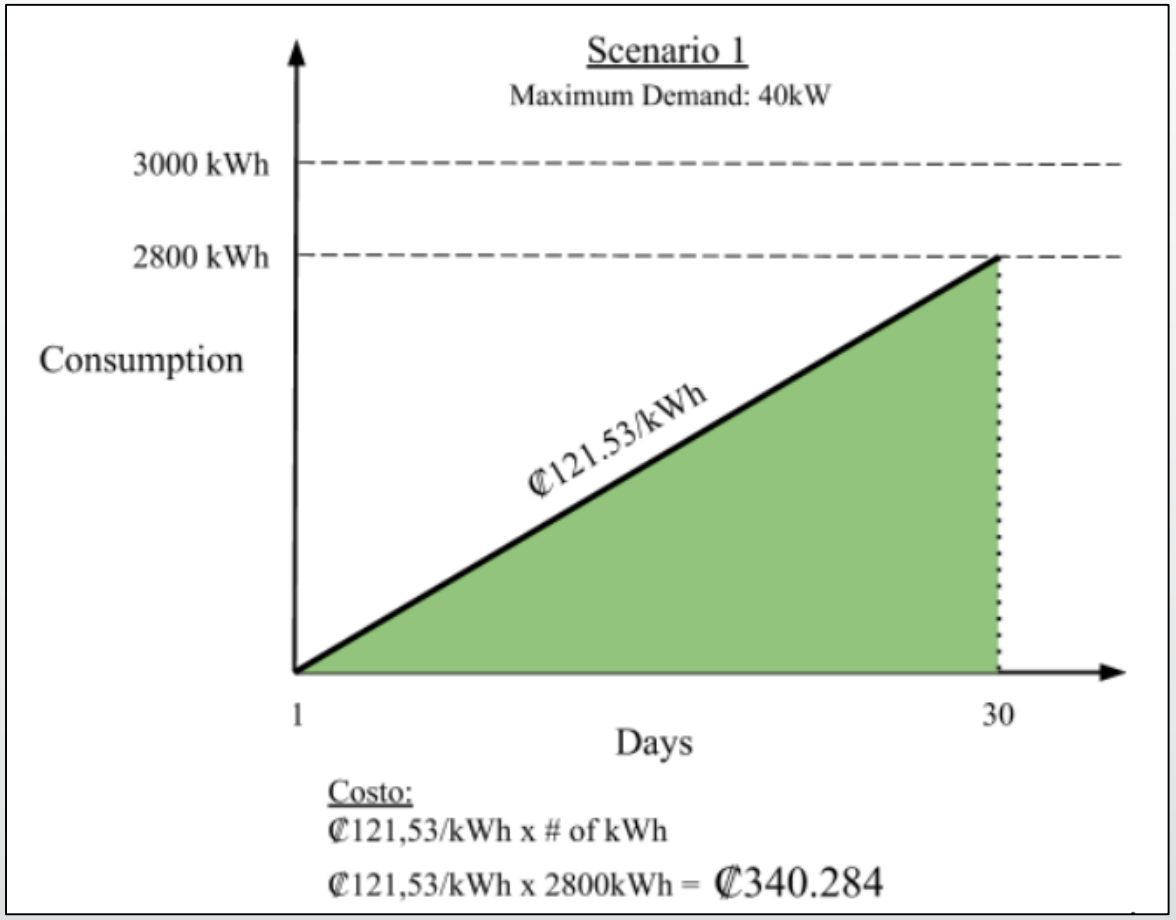
Additional Obstacles for Solar Panel Providers and Users

- **Distance Factors**
  Travel outside the GAM

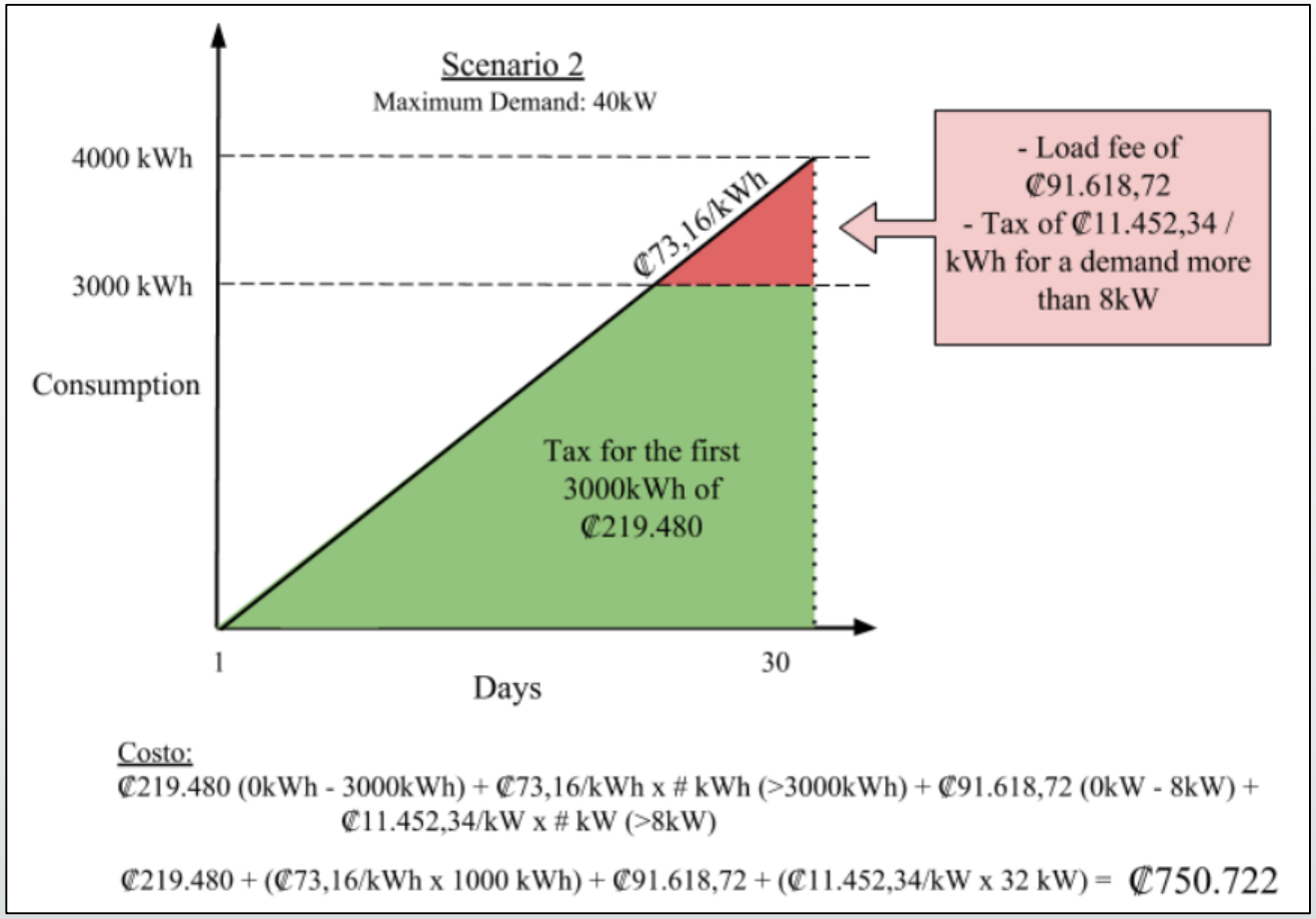
- **Low Quality Panels and Installations**
  Suppliers buy unknown brands

- **Long-term thinking**
  Difficult to convince customers about a ROI of 7 to 8 years

3000kWh Rule



Costo:
₡121,53/kWh x # of kWh
₡121,53/kWh x 2800kWh = ₡340.284



Costo:
₡219.480 (0kWh - 3000kWh) + ₡73,16/kWh x # kWh (>3000kWh) + ₡91.618,72 (0kW - 8kW) + ₡11.452,34/kW x # kW (>8kW)

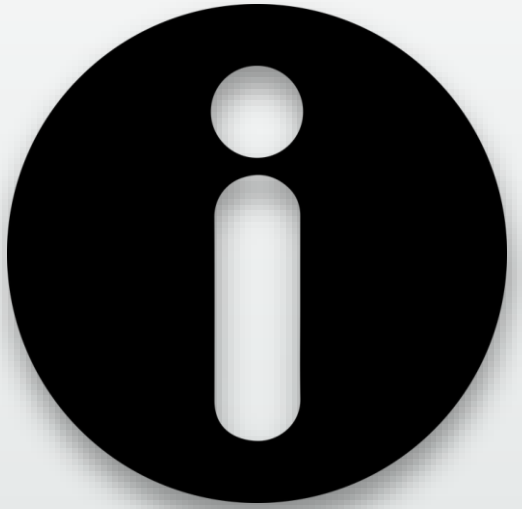
₡219.480 + (₡73,16/kWh x 1000 kWh) + ₡91.618,72 + (₡11.452,34/kW x 32 kW) = ₡750.722

Objective 2

Create a profile of solar panel providers in Costa Rica

Collected Information

- Background of the businesses
- Technologies provided
  - Types and brands
- Distribution zones
- Typical system sizes
- General costs per kWh
- Average return on investment



System Size	< 10 kW	10 kW - 100 kW	100 kW - 200 kW	> 200 kW
Price per watt installed:	Approx. $2.00	$1.20 - $1.50	$1.00 - $1.20	$1.00 or less
Estimated Return on Investment	7 - 8 years	6 - 8 years	5 - 7 years	3 - 5 years

Objective 3

Create case studies of companies that have successfully implemented solar energy

Establishment LABS

220kW solar array

864 Canadian Solar photovoltaic solar panels

6 Canadian Solar inverters

Lithium-Ion battery bank

Building was designed around

energy system

Curridabat

Sunshine Energía Solar

Parámetro	Descripción
Cantidad de Módulos FV	108
Cantidad Inversores	3
Potencia @STC (kWp)	34,56
Compensación de consumo promedio Anual (kWh)	49 380,00
Compensación de consumo energético promedio anual (%)	70%
Compensación del monto factura eléctrica anual (%)	45%
kWh/kWp estimado ($)	1.21
Retorno inversión años	5

Ciudad Toyota

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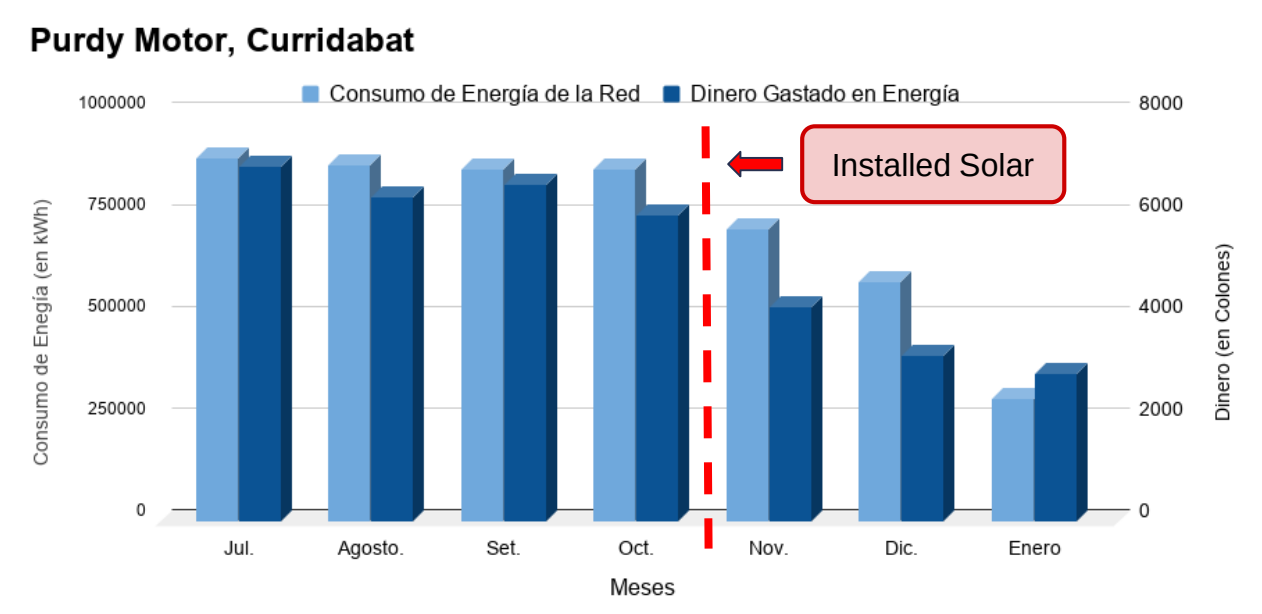
Parámetro	Descripción
Cantidad de Módulos FV	3 154
Cantidad Inversores	62
Potencia @STC (kWp)	995
Compensación de consumo promedio Anual (kWh)	1 444 034,80
Compensación de consumo energético promedio anual (%)	82%
Compensación del monto factura eléctrica anual (%)	47%
kWh/kWp estimado ($)	1.37
Retorno inversión años	5



TOYOTA PURDY MOTOR GRUPO PM

995 kW array

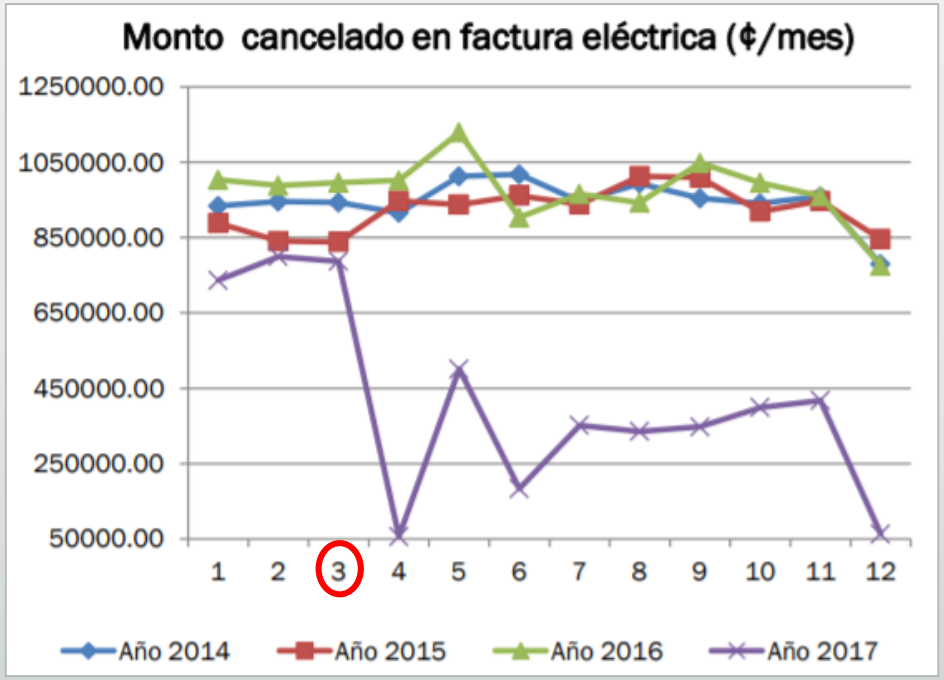
4 month installation process

No energy storage

Estimated ROI = 5 years

30 year warranty

Required a new roof before solar installation



ASTEK COSTA RICA

ASTEK

Creadores de aromas y sabores

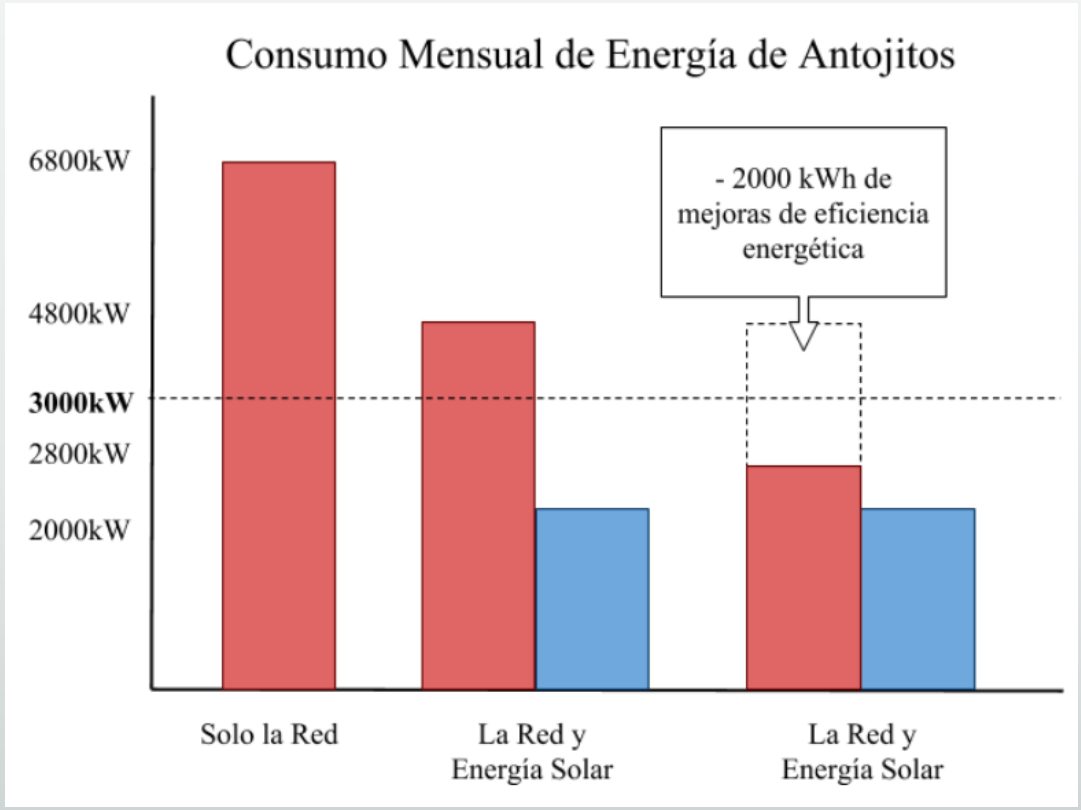
51.2kW system

Estimated ROI = 7 years

3 month installation process

15 year warranty

Aiming towards consistently consuming zero energy from the grid



Antojitos® SAN PEDRO

1700 kWh per month

Estimated ROI = 8 years

10 year warranty

Waited months for the distributor to interconnect

Efficiency was the main priority that helped make it worthwhile to switch to solar

BAC San José

160 panels

5520 kWh per month

ROI = 6 years

Paid off in 2016

10 year warranty

All of the locations are certified carbon neutral

25 locations have ISO 14001 certification

Objective 4

Create a Renewable Energy Guide

Conclusions

The 49% rule, 15% rule, access tariff, and confusion on how exactly they are applied lead people to associate solar energy as a cost rather than an investment.

Customers often have false pricing information and think only short-term

Despite these obstacles, case study companies prove the benefits of solar energy.

A guide is necessary to address these obstacles and give industries accurate information about solar energy usage in Costa Rica.

Recommendations

Continue to expand profiles on solar providers and case study companies

Make an announcement for the website to create awareness

Hold workshops to promote energy efficient investments

Keep the website updated

MINISTERIO DE AMBIENTE Y ENERGIA

asociación costarricense de energía solar

Expand the 49% and 15% rules to a higher percentage and reduce or remove the access tariff.

Aim to set mandatory standards for solar technology

Push for legislation to reduce the importation tax on lithium-ion batteries

Acknowledgements

Akira Hidalgo Segura
Claus-Bernhardt Johst
La Cámara de Industrias

Doña Marcela Music
Sr. Jimmy Music
Costa Rican Site Coordinators

James Chiarelli
Stephen McCauley
Worcester Polytechnic Institute

Anthonie Latouche of Establishment Labs

Arturo Gaviria of Cielo Vivo

Gastón Broutin Sheik of ICE

Gladys Ponce of Astek

Ignacio Salazar of greenenergy©

Jonathan Mata of Purdy Motor

Karen Tat of ACESOLAR

Marco Varela of HiPower

Muni Figueres of Antojitos

Pierre Lambot of Purasol

Thank You!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Questions?