EFFICIENCY FOR ACCESS

UK ENGINEERS WITHOUT BORDERS

Refrigeration appliances

Funded by:

UKaid from the British people

IKEA Foundation

Agenda

- **Efficiency for Access R&D Awardee Spotlight: Devidayal**
- **Solar-powered cold storage for developing countries**

- Q&A
- Webinar feedback survey

Our speakers

- **Tushar Devidayal**
  - Founder/CEO Devidayal Solar Solutions
  - Previously worked in leveraged finance in New York City, served in a leadership role in his family owned agri-input business
  - Was India country manager for Arysta LifeScience.
  - Has an MBA from London Business School.

- **Nnaemeka Ikegwuon**
  - Founder/CEO ColdHubs Limited
  - Executive Director of Smallholders Foundation
  - He founded Smallholders Foundation at the age of 21 (www.smallholdersfoundation.org.ng)

EFFICIENCY FOR ACCESS

Efficiency for Access R&D Awardee Spotlight

Tushar Devidayal - Devidayal Solar Solutions

UK ENGINEERS WITHOUT BORDERS

1. Who we are

Company Overview

Devidayal Solar Solutions focuses on the design, manufacture, sale and distribution of productive use off-grid solar DC appliances for income generation and enhancement. Our flagship product is a solar DC refrigerator:

- Based in India
- Solar refrigeration and cooling solutions to solve cold-chain related issues
- Focus on agriculture, dairy, fishing

DEVIDAYAL
SOLAR SOLUTIONS

2. Product / Technology Overview

Key Features

- Designed for storage drinks, dairy and food (light commercial use).
- Efficient DC compressor (0.329 KwHr/24 Hr). Digital display, rugged construction, environmentally compliant refrigerant, works on 2 solar panels and a reserve battery.
- Solar module and sizing of the freezer is customised to suit the end-use.
- Temperature range 1 -11C and -18C to +8C.
- Solar DC 12V/24V and 48 V DC.
- Tested by CLASP in The Netherlands - IEC 62552 (steady-state operation power consumption at 16C, 32C, and 43C, load processing efficiency, freezing capacity).
- **PayGo model coming soon!**
- **Vaccine racks and temperature data logger kit available!**

Solar DC Refrigerator 100 Ltr

3. Awards & Prizes

Winner of Global LEAP Awards / Consumer Affordability Prize

GLOBAL LEAP AWARDS

Global LEAP Awards

Off-Grid Refrigerator Competition

FINALIST: MEDIUM REFRIGERATOR

Devidayal Solar Solutions has been named a Finalist in the Medium Refrigerator Category of the 2019 Global LEAP Awards Off-Grid Refrigerator Competition for the following product model:

Devidayal Solar Solutions

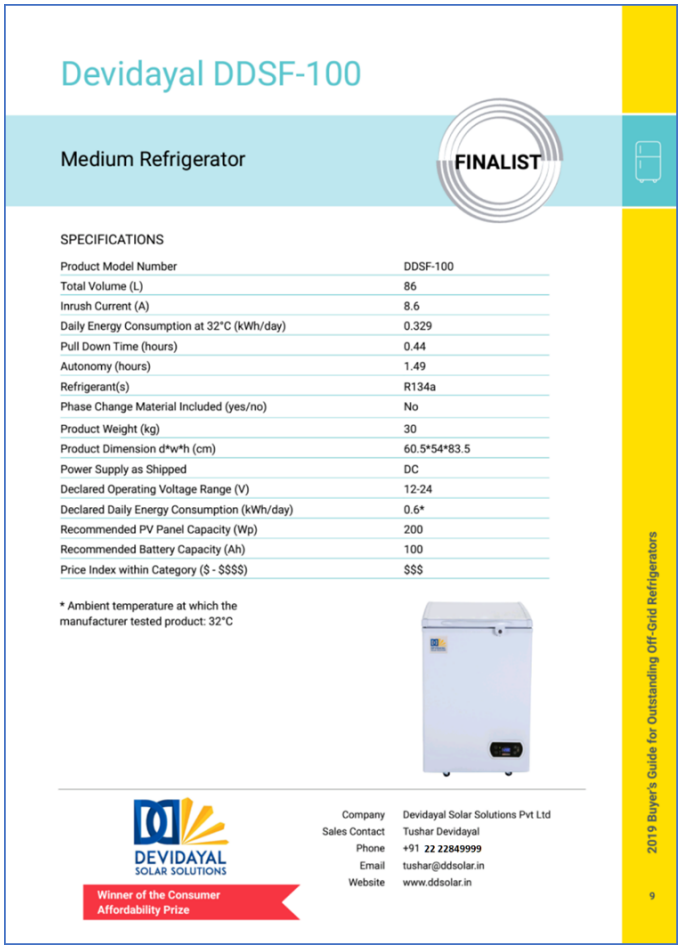
DDSF-100

October 2019

The Global LEAP Awards is an international competition to identify and promote the world's best, most energy efficient off-grid appliances. All nominated off-grid refrigerators underwent evaluation by a panel of off-grid market experts and product testing by an accredited laboratory.

The 2019 Global LEAP Awards recognize outstanding off-grid refrigerators and solar water pumps. Winning and Finalist off-grid refrigerator products are named in each of three categories: small refrigerator, medium refrigerator, large refrigerator, refrigerator-freezer combination unit, and solar direct drive refrigerator.

Global LEAP Outstanding Off-Grid Appliance Awards
www.globalleapawards.org



Devidayal DDSF-100

Medium Refrigerator

FINALIST

SPECIFICATIONS

Product Model Number	DDSF-100
Total Volume (L)	86
Inrush Current (A)	8.6
Daily Energy Consumption at 32°C (kWh/day)	0.329
Pull Down Time (hours)	0.44
Autonomy (hours)	1.49
Refrigerant(s)	R134a
Phase Change Material Included (yes/no)	No
Product Weight (kg)	30
Product Dimension d*w*h (cm)	60.5*54*83.5
Power Supply as Shipped	DC
Declared Operating Voltage Range (V)	12-24
Declared Daily Energy Consumption (kWh/day)	0.6*
Recommended PV Panel Capacity (Wp)	200
Recommended Battery Capacity (Ah)	100
Price Index within Category ($ - $$$$)	$$$

* Ambient temperature at which the manufacturer tested product: 32°C

DEVIDAYAL SOLAR SOLUTIONS

Winner of the Consumer Affordability Prize

Company	Devidayal Solar Solutions Pvt Ltd
Sales Contact	Tushar Devidayal
Phone	+91 22 22849999
Email	tushar@ddsolar.in
Website	www.ddsolar.in

2019 Buyer's Guide for Outstanding Off-Grid Refrigerators

4. How much does it cost? Is it worth it?

Winner of the Consumer Affordability Prize

How much does it cost?

Prod	DDSF 100 Ltr	DDSF 150 Ltr	DDSF 200 Ltr	DDSF 268 Ltr
Est. price*	$ 800	$ 933	$ 1,067	$ 1,200
Price includes taxes, freight, standard panel and battery configuration, installation & commissioning. Price also includes 12 month financing from an Indian bank.				

Is it worth it?

1. SELCO Foundation (March 2019) study focus on productive-use and income generating activities in solar DC refrigeration (sample size ~75). The report showed incremental income of US$100 per month from a solar DC refrigerator
2. On the cost side, we have won a consumer affordability prize for design including freight and logistics savings and financing offered.
3. At present, in India these finance packages are available on a 20% down payment with EMIs from AU Bank.

5. Product Affordability – Business Models

SDG Goal 7: Affordable and Clean Energy

SDG Goal 8: Decent Work and Economic Growth

The solution is a combination of energy access and energy efficiency with our award-winning solar refrigerator.

- Right **financial and business models** to suit end user's local business needs
- **Milk & dairy products retail** and supply chain
- Retail solutions for **locally sourced products** like those procured from home-based local entrepreneurs.
- These are typically rapidly perishable, seasonal and high demand including **sugarcane** and **local fruit juices.**
- **Fish** and **poultry products**, storage of **flowers** outside places of worship and others.

Photo credit: SELCO Foundation

6. Business model case study

Truck-mounted solar refrigerators:

Enabling women entrepreneurs to reach markets through technology

#PoweringAgriculture

This project is funded by the Efficiency for Access (E4A) / Research & Development Fund.

6(i). The Context

- Location: Rajasthan, India
- Tribal district – we are working with the Grashiya tribe
- Low levels of literacy
- The tribal women harvest fruit (non-timber forest produce) from the forest

Gram Shree
Innovative Marketing Solutions for Poor

Local partner: Received First Prize in Agri Startup in I-pitch 2018 held in April, 2018. This was organized by Villgro and CIIE Ahmedabad

- Main forest produce – *sitaphal* or custard apple, jamun
- Selling this produce is a source of major livelihood for the farmers of this region.
- But the above-mentioned challenges like lack of awareness and exploitation by other market players force the farmers to sell their produce at a throwaway rate of INR 3 to 4 per Kg.
- The end user buys the pulp (for ice-cream and local desserts) at the rate of INR 100 - 150 per Kg, the situation is not optimal.

6(ii). The Solution: Solar cold chain

- Tribal farmers are not aware of the existing market conditions and rates
- Lack of cold-chain infrastructure, frequent power cuts
- Their problems are compounded due to the small shelf life of the produce
- Distress sale

- After our intervention with a cold chain truck, the tribal women have more holding (and thus bargaining) power
- We expect that approx. 300 women will get employment opportunity in the fruit collection and processing unit. This will be seasonal employment.
- Women will be more aware about the quality of fruit and gain skills of processing hence will be empowered to deal with purchasers

6(iii). The Impact – In pictures

Left: Woman entrepreneur explaining sitaphal picking

Right: Launch event

Left: Sitaphal pulping machine to be run on solar (proposed)

Right: Jamun Processing

6(iv). The Technology

Devidayal Cold Chain Truck In pictures

6(v). Next Steps: Monitoring & Evaluation

lateral praxis
inclusive innovation

M&E metrics

1	Livelihood	Revenue increase, profit per month per truck
2	Job creation as a result of the cold chain	Number of jobs created
3	Food wastage avoided	Kg, INR

EFFICIENCY FOR ACCESS

Thank you

Tushar Devidayal | Founder & CEO
E: tushar@ddsolar.in | www.ddsolar.in

UK ENGINEERS WITHOUT BORDERS

EFFICIENCY FOR ACCESS

Solar-powered cold storage for developing countries

Nnaemeka Ikegwuon – Cold Hubs

UK ENGINEERS WITHOUT BORDERS

Cold Hubs

Solar-powered cold storage for developing countries

designed to greatly reduce post-harvest loss for 470 million small farmers in Africa, Latin America, and Southeast Asia


Smallholder Farmers
Rural Radio 98.0FM

PROBLEM

In Nigeria, 45% of food spoils due to lack of cold storage...

...this causes 93 million small farmers to lose 25% of their annual income.

Source: Rockefeller Foundation; Food Waste and Spoilage Initiative 2014

Cold refrigeration is non-existent in Nigerian farms and marketplaces.

X **Most solutions are not rugged enough to withstand harsh conditions**

X **Power grids are not capable of delivering reliable energy**

X **Most equipment is too costly for the average farmer to purchase**

SOLUTION

Walk-in, solar-powered cold stations for 24/7 storage and preservation.

TECH, DESIGN ASSEMBLY

PARTS

- Cold Room Panels
  - Vitapur
- Refrigeration units
  - Rivacold
- Solar Panels, Batteries, and Inverters
  - Hoppecke, SMA and Jinko Solar

SCIENTIFIC + TECHNICAL DESIGN PARTNER

- Institut fur Luft Kaltechnik gemeinnnutzige GmbH
  Institute for Air Conditioning and Refrigeration (Germany)

ASSEMBLY

- Assembled in-country by staff engineers

DISTRIBUTION + MAINTENANCE

- Distributed and maintained in-country by staff engineers

ILK Dresden

TOTAL COST

Cold Panels:
$4,150

Refrigeration:
$2,675

Solar Panels:
$4,960

Batteries:
$6,800

Inverter:
$3,881

Others:
$12,523

$34,989/Unit

REMOTE MONITORING

Offers education for post harvest management

Extends the shelf life of perishable food from 2 days to 21.

3 YEAR IMPACT OF 24 HUBS

20,400 tons of fruits and vegetables saved from spoilage

3,517 farmers, retailers and wholesalers have increased their income to **US $120**

28 jobs created for women

REVENUE MODEL

We charge $0.50 USD/night to rent 1 plastic crate

Each station holds 150 crates - up to $75 USD/day in revenue

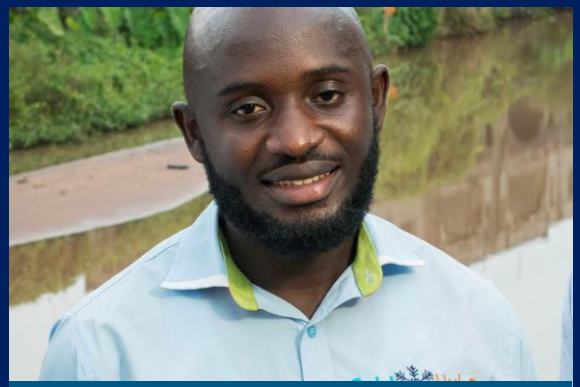
100% utilization = $27,375 USD/year 50% utilization = $13,687 USD/year

EXPANDING

30 new ColdHubs under construction now.

54 ColdHubs by the end of 2020

THE TEAM



Bright Benjamin Igbokwe
COO

Experienced business development manager with extensive expertise in agribusiness startups, rural logistics, distribution, commercial strategy, contract negotiations, business processes, and team building.

Masters in Business Administration
Imo State University, Nigeria

Chidubem Maxwell
CTO

Electrical and electronics engineer, with extensive knowledge and expertise in clean energy, solar cells, batteries, air conditioning, cold room design, and refrigeration.

HND, Electrical & Electronics Engineering, Federal Polythenic Nekede, Owerri, Nigeria

Terence Usibe
CFO

Experienced office and finance administrator managing our accounts within local and international standards.

HND in Accounting
Imo State Polytechnic Umuagwo


giz
Deutsche Gesellschaft
für Internationale
Zusammenarbeit (GIZ) GmbH


WFP
World Food Programme
wfp.org


gain
Global Alliance for
Improved Nutrition


Swiss Re


FACTOR[e]
VENTURES


AllON
Energy innovations.
Powerful collaborations.


GLOBAL COLD CHAIN
ALLIANCE®


ILK Dresden
Institut für Luft- und Kältetechnik
gemeinnützige Gesellschaft mbH


Microsoft


KING BAUDOUIN
FOUNDATION


UKaid
from the British people
Department
for International
Development


USAID
FROM THE AMERICAN PEOPLE

EFFICIENCY
FOR
ACCESS

Thank you

Nnaemeka@coldhubs.com
+234 806 0292346
www.coldhubs.com

UK
ENGINEERS
WITHOUT BORDERS

EFFICIENCY
FOR
ACCESS

Q&A

UK
ENGINEERS
WITHOUT BORDERS


EFFICIENCY
FOR
ACCESS