USAID
FROM THE AMERICAN PEOPLE

POWER AFRICA
A U.S. GOVERNMENT-LED PARTNERSHIP

OFF-GRID PRODUCTIVE USE OF ENERGY 2021 CATALOG

Liberia

Browse

ACRONYMS AND ABBREVIATIONS

AC	alternating current
Ah	ampere hours
ALPS	aquaculture, livestock, and poultry solutions
°C	Celsius
DC	direct current
DIN	German Institute for Standardization (*Deutsches Institut für Normung*)
DRC	Democratic Republic of Congo
EC	European Commission
EN	European Standard
°F	Fahrenheit
FBO	farmer-based organizations
GSM	global system for mobile communications
h	hours
HP	horsepower
IEC	International Electrotechnical Commission
IP	international protection
ISO	International Organization for Standardization
kg	kilograms
kW	kilowatts
kWh	kilowatt hours
kWp	kilowatt peak
L	liters
LCB	linear current booster
LV	low volume
m	meter
ml	milliliter
m^2	square meters
m^3	cubic meters
MFI	microfinance institution
min	minute

ACRONYMS AND ABBREVIATIONS

mm	millimeter
MPPT	maximum power-point tracking
PAYGO	pay-as-you-go
PV	photovoltaic
PUE	productive use of energy
SACCO	savings and credit cooperative
SARL	incorporated business (*Société a responsabilité limitée*)
SAS	simplified joint-stock company (*Société par actions simplifiée*)
T / Tel	telephone number
V	volts
V DC	volts direct current
V AC	volts alternating current
W	watts
Wp	watt peak

ACKNOWLEDGEMENTS

The Off-grid Productive Use of Energy 2021 Catalog (this "Document") was produced by RTI International for Power Africa in December 2021.

Contract: IDIQ No. 720-674-18-D-00004 | **Task Order:** 720-674-19-F-00005

RTI International is grateful for the cooperation of the companies whose products feature in this Document and would like to thank everyone involved in the research, development, and review of the content included in the Document.

Special thanks go to:

- Practical Action for research and content development.
- CLASP for contributing and reviewing technical content.
- Top Consulting, Inc. Liberia

Cover Photo Credit: Annie Spratt on Unsplash

DISCLAIMER

BACKGROUND

Power Africa is a U.S. Government-led partnership that brings together the collective resources of over 170 public and private sector partners to double access to electricity in sub-Saharan Africa. Power Africa's goal is to add more than 30,000 megawatts of new electricity generation capacity and connect 60 million new homes and businesses to power by 2030. Read more: www.usaid.gov/powerafrica.

Agriculture in Africa requires a reliable energy supply to grow and improve productivity. For farmers in most African countries, access to fuel or electricity for farm operations, crop processing, and food storage is limited and costly. Rapid growth in agricultural production can stimulate rural and general economic development.

The Power Africa Off-grid Project provides technical assistance to private sector companies, agricultural cooperatives, agribusinesses, and government stakeholders to increase the uptake of off-grid energy solutions, such as solar home systems (SHS), mini-grids, and productive use of energy (PUE) technologies. Through its crosscutting work stream, the Project promotes PUE adoption by supporting off-grid companies to:

- Expand their product portfolios to include PUE.
- Access finance to grow, enter new markets, and pilot PUE business models across agricultural value chains.
- Innovate as the sector matures.

INTRODUCTION

What is productive use of energy (PUE)?

In this catalog, PUE refers to any electrical and thermal equipment and technology that serves as a direct input to produce goods or provide services for income-generating activities.

Objectives

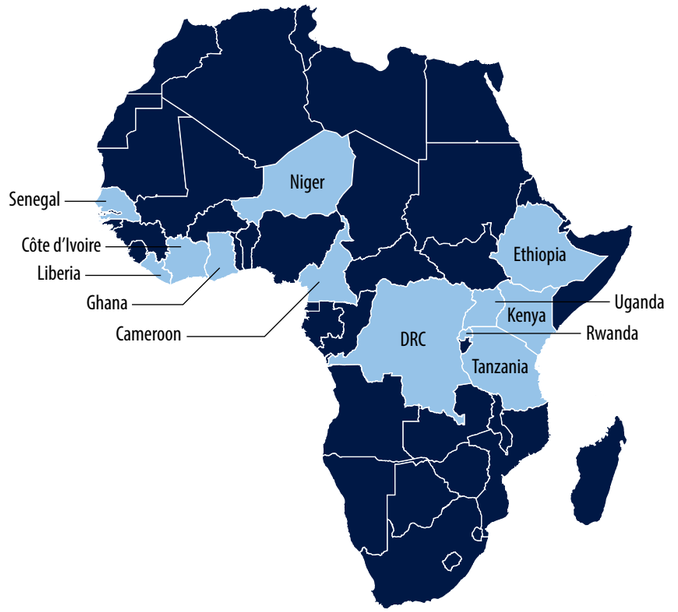
This catalog aims to increase awareness and uptake of the off-grid PUE appliances that are available in the Liberian market. The catalog provides stakeholders (including manufacturers, suppliers, nongovernment organizations, and government policymakers) with insight into PUE products and innovations.

This catalog is part of a collection aiming to:

- Increase the knowledge base of off-grid PUE equipment.
- Meet the PUE demand of East and West Africa.
- Identify sectors in which greater adoption of PUE products can stimulate economic development.

Selected Countries

The collection of catalogs covers twelve countries: Cameroon, Côte d'Ivoire, DRC, Ethiopia, Ghana, Kenya, Liberia, Niger, Rwanda, Senegal, Tanzania, and Uganda.



INTRODUCTION

Contents

The catalog includes technical and financial information on a range of PUE technologies with a focus on agriculture, fishing, livestock, and poultry.

The catalog presents information on:

- The terms of sale for PUE products.
- Pay-as-you-go (PAYGO) integration capabilities.
- Manufacturer, distributor, and supplier channels.

Audience

A wide range of participants in the off-grid energy sector can use the catalog to inform their decisions. This audience comprises government policymakers, private-sector practitioners, stakeholders from nongovernment and community organizations, investors, financial institutions, and end-users.

CRITERIA FOR SELECTION OF PUE PRODUCTS

The catalog's scope is limited to off-grid PUE products for agriculture, fishing, livestock, and poultry and does not include other uses of energy, such as phone charging. Featured technologies include photovoltaic (PV) solar and those that combine electrical and thermal power, such as food dryers.

Applications and value chains include the following:

Category	Examples
Agricultural production	Water pumping solutions, solar spraying
Agricultural conservation	Fridges and freezers
Agricultural processing	Grain mills, threshing and husking machines, and food dryers
Livestock and poultry	Egg incubators, milk chillers, and fodder preparation (e.g., chaff cutters)
Fishing and aquaculture	Cold storage units (e.g., ice machines), fishing lights

HOW TO READ THE CATALOG

The catalog has two sections:

Section 1: Company information

This catalog reviews local companies supplying PUE products in the relevant country and outlines general information about the companies, such as contact information and current product offerings.

This catalog classifies companies into four categories:

1. **Manufacturer:** A company that builds, designs, and packages products for a market.
2. **Distributor:** A company that buys products or product lines from a manufacturer and sells them directly to end-users or supplies them to other retailing companies.
3. **Brand Representative:** An international company's in-country subsidiary or partner company that fulfills sales and other services for end-users.
4. **Reseller/Retailer:** A company (or entity) that receives products from a distributor and sells them directly to end-users.

Section 1 also identifies ten types of distribution channel:

1. Direct retail
2. Online retail
3. On-order
4. Large distributors
5. Retail through farmers' cooperatives/producer groups and savings and credit cooperatives (SACCOs)
6. Retail through kiosks and similar outlets
7. Retail through microfinance institutions (MFIs)
8. Retail through outgrower schemes
9. Retail through sales agents
10. Retail through women's groups

This section classifies payment models into six categories:

1. PAYGO
2. Flexible installments (hire purchase agreement leasing)
3. Cooperation with local banks or MFIs
4. Cash payment or cash and carry
5. Product sold only as part of a package
6. Fee-for-service

HOW TO READ THE CATALOG

Section 2: Product information

This section supplies technical information on PUE products and further categorizes products into six sections according to technology:

1. **Agro-processing:** Mills, hullers, threshers, crushers, paste makers, and oil presses.
2. **Cooling:** Cold rooms, freezers, ice-making machines, milk tanks, and refrigerators.
3. **Food dryers:** Thermal and ventilation-based solutions.
4. **Aquaculture, livestock, and poultry:** Fishing lights and egg incubators.
5. **Pumping:** Surface pumps and submersible pumps.
6. **Sprayers:** Animal medical treatments, disinfectants, fungicides, herbicides, insecticides, and pesticides.

HOW TO READ THE DATASHEETS

The following reference table explains product information and technical specifications for the product categories of pumps, fridges, mills, dryers, and ALPS (aquaculture, livestock, and poultry solutions). The table also shows country-specific data.

Datasheet Heading	Explanation	Unit of Measure	Product Category
Product Information			
Product name	Product brand name and model	–	All
Manufacturer	The company that manufactures the product	–	All
Picture	Image of the product	–	All
Product description	Characteristics of the product	–	All
Target use	How the product is used and its intended users	–	All
Countries available	Countries where the product is sold	–	All
Technical Specifications			
Models	Specific model type, series, and number if applicable	–	Pumps, Mills
Product type	Submersible or surface pump	–	All
Load	The power required to operate the solution	W	Pumps
Pump type	Operational category of the pump, based on its mechanics, e.g., centrifugal, helical, or piston	–	Pumps

HOW TO READ THE DATASHEETS

Datasheet Heading	Explanation	Unit of Measure	Product Category
Automation	Process by which equipment performs an action through an electronically controlled system and often without human assistance	–	ALPS
Electrical output	Electrical energy produced by the product	kW	Dryers
Thermal output	Thermal energy produced by the product	kW	Dryers
Mechanical output	Mechanical energy produced by the product	kW	Dryers
AC/DC coupled	Type of electric current	AC or DC or both	All
Electrical efficiency	Measurement of the ratio between the energy input and the electrical-energy output	%	Dryers
Thermal efficiency	Measurement of the ratio between the energy input and the thermal-energy output	%	Dryers
Voltage range	Operating voltage range of the product	V DC or V AC	Pumps, Fridges, Mills, ALPS
Throughput	Processing-capacity output of the product	kg/h	Mills
Egg capacity	Number of eggs the incubator can hold in one batch	eggs	ALPS

HOW TO READ THE DATASHEETS

Datasheet Heading	Explanation	Unit of Measure	Product Category
Power rating	Highest approved power input of the product's motor	W	Pumps, Fridges, Mills, ALPS
Required solar panel size	The PV-panel capacity required to power the product	W or Wp	Pumps
Storage capacity	Volume of available storage	L	Fridges
Operating temperature	Operating temperature of the product	°C (°F)	Fridges
Capacity of PV modules required	PV panel capacity required to power the product	Wp or W	Fridges, Mills, ALPS
Holdover time	The time taken by the product to raise the inside cabinet's temperature from its cut-off temperature to the maximum temperature limit of its recommended range. For example, for a fridge with an operating temperature of 4 °C (39.2 °F) and a maximum operating temperature of 8 °C (46.4 °F), the holdover time is the time taken to reach 8 °C (46.4 °F) from 4 °C (39.2 °F) in case of a power loss	h or min	Fridges

HOW TO READ THE DATASHEETS

Datasheet Heading	Explanation	Unit of Measure	Product Category
Power (energy consumption)	Daily energy consumption of the product	W or Wh/day	Fridges
Product dimensions	External measurements of the product (recorded as length × width × height, unless otherwise noted)	length x width x height	Fridges, ALPS
Total dynamic head	Maximum height at which a pump can raise water, inclusive of friction losses	m	Pumps
Max discharge rate	Maximum rated volume of water pumped per hour	m^3/h	Pumps
Controller requirements	Requirement for an external pump controller	–	Pumps
Lamp display/output	Amount of light produced	lumens	ALPS
Lighting duration	Length of time that the product produces light	hours	ALPS
Battery size	Type, size, and specifications of the battery	Ah	ALPS
PAYGO integration capabilities	Compatibility with PAYGO	–	All
Product link	Product website or datasheet link	–	All

HOW TO READ THE DATASHEETS

Datasheet Heading	Explanation	Unit of Measure	Product Category
Distribution channels	Channels listed under the following categories: • Direct retail • Online retail • On-order • Large distributors • Retail through farmer cooperatives/producer groups and savings and credit cooperatives (SACCOs) • Retail through kiosks and similar outlets • Retail through microfinance institutions (MFIs) • Retail through outgrower schemes • Retail through sales agents • Retail through women's groups	–	All

HOW TO READ THE DATASHEETS

Datasheet Heading	Explanation	Unit of Measure	Product Category
Payment models / terms of sales	Models and terms listed under the following categories: • PAYGO • Flexible installments (hire purchase agreement or leasing) • Cooperation with local banks or MFIs • Cash payment or cash and carry • Product sold only as part of a package • Fee-for-service	–	All

SECTION 1

COMPANY INFORMATION

COMPANY LIST

Companies	Distributed Technologies	Category	Distribution Channels	Payment Models
Ecopower Liberia Robertsfield Highway, R2 Community, Paynesville City, Monrovia, Liberia Vickson Korlewala +231 777-283-982 +231 881-329-455 vickson.korlewala@ecopower.com www.ecopowerliberia.com	**Pumps** • Futurepump SF2 • Omnivoltaic solar-powered pumps **Fridges** • Felicity Solar	Distributor	Direct retail	Cash & carry
LIB Solar Hotel Africa Road, Monrovia Nicholai Lidow +231 770-011-233 nicholai@lib.solar www.lib.solar	**Fridges** • Koolboks 208 L refrigerator	Distributor	Direct retail	Cash & carry Pay-as-you-go (PAYGO)

COMPANY LIST

Companies	Distributed Technologies	Category	Distribution Channels	Payment Models
West Coast Energy Roberts Field Highway, adjacent Jamaica Resort, Paynesville City, Monrovia Paul Kollie 077-018-5084 077-641-8033 088-655-3263 kolliepaul6@gmail.com finco@westcoastsupplier.com www.westcoastenergylib.com	**Pumps** • Grundfos solar-powered submersible SQFlex pump • Sunpump **Fridges** • SunDanzer	Distributor	Direct retail Large distributor	Cash & carry Flexible installments

SECTION 2

PRODUCT INFORMATION

QUALITY STANDARDS

Product	Quality Standards	VeraSol-tested / Certified
Pumping Solutions		
Futurepump SF2	N/A	VeraSol-tested
Grundfos CR Flex Series	International Electrotechnical Commission (IEC) and German Institute for Standardization (*Deutsches Institut für Normung [DIN]*)	N/A
Grundfos SQ Flex Series Centrifugal Pumps	IEC and DIN, International Organization for Standardization (ISO)	N/A
Grundfos SQ Flex Series Helical Pumps	IEC and DIN, ISO	VeraSol-tested
Omnivoltaic Solar-powered Pump	N/A	VeraSol-tested
Sun Pump SDS-T Series DC Submersible Pumps	N/A	N/A
Cooling Solutions		
DGrid Solar Cool Cube Model 188 (Single Chamber) and Model 426 (Dual Chamber)	N/A	N/A

QUALITY STANDARDS

Product	Quality Standards	VeraSol-tested / Certified
Cooling Solutions		
Felicity Solar	N/A	N/A
Koolhome Full-option Freezer/ Refrigerator	N/A	VeraSol-tested
Koolhome Classic Freezer/ Refrigerator	N/A	VeraSol-tested

COOLING SOLUTIONS

Cooling Solutions – List of Featured Products

1. Koolhome Full-option Freezer/Refrigerator
2. Koolhome Classic Freezer/Refrigerator
3. Felicity Solar 200 L DC Solar-powered Freezer
4. SunDanzer Solar Direct Drive Series (BFRV15 and BFRV55 Models)
5. SunDanzer Hybrid Series (DCRV75-KIT and DCRV20-KIT Model)
6. SunDanzer Direct Drive Ice Pack Freezer

Ⓥ = VeraSol-tested/-certified

QUALITY STANDARDS

READ MORE ABOUT COOLING SOLUTIONS

COOLING SOLUTIONS

Cooling solutions: Introduction

Cooling solutions range from solar fridges and freezers to solar cold rooms, solar ice-cube makers, and solar milk tanks.

Solar fridges and freezers

Solar fridges and freezers preserve produce, make ice, and store vaccines. In this catalog, all solar fridges and freezers are solar products, powered by solar panels, with a voltage system of 12 V and 24 V DC. Most solar fridges use batteries for a continuous energy supply; however, some have very effective insulation capabilities, which allow them to function without battery power. If powered by PV panels, the equipment may not draw enough solar energy to maintain low refrigeration temperatures in severe cloud cover or at night. Therefore, the equipment must conserve low temperatures with high-efficiency insulation, draw reserve power, or couple with another source of power (e.g., a battery).

The capacity of the fridges and freezers is measured in liters, which manufacturers usually indicate. Freezers operate only at negative temperatures in Celsius (up to -18 °C [-0.4 °F]), although some freezers can also serve as refrigerators.

In most cases, solar fridges and freezers are imported from Europe and the United States of America.

Solar cold rooms

Solar cold rooms have a variety of applications. Their cooling temperatures can be adjusted and monitored.

The cooling chambers preserve fruits and vegetables (usually at positive temperatures) and meat and fish (usually at negative temperatures) over long periods. In general, most cold rooms are large industrial units, but smaller sizes are also manufactured locally. In this catalog, all cold rooms are powered by solar panels with varying voltage systems (AC and DC).

COOLING SOLUTIONS

Solar ice-cube makers

The solar ice-cube makers are machines that produce ice in large quantities. These machines are useful for people who need ice in large quantities daily, such as fishers or fish sellers who need to preserve and transport fish. Ice-cube makers are powered by solar panels but run on AC voltage.

Solar milk tanks

Solar milk tanks refrigerate raw milk from animal milking to preserve it. Such tanks usually operate at a positive temperature of approximately 4 °C (39.2 °F). The capacity of these tanks (measured in liters) varies by model.

TERMS OF SALE

Cash & carry

PAYGO

PRODUCT SPECS

PRODUCT LINK

KOOLHOME FULL-OPTION FREEZER/REFRIGERATOR

The Koolhome Full-option model, designed and developed by Koolboks Ltd, offers reliable long-term cold-storage through its insulation and ice battery technology. With its adjustable temperature range, the product can function as a refrigerator or freezer. This freezer has an integrated 12 V 36 A h lithium battery.

Target use: Food storage

Manufacturer:
Koolboks
Rosny-sous-Bois, France

Distributor(s):
Lib Solar

Distribution channels:
Direct retail

SPECS | Koolhome Full-option Freezer/Refrigerator

Product information	BD-158	BD-210
Product type	Solar freezer/refrigerator	Solar freezer/refrigerator
AC/DC coupled	DC	DC
Voltage range	12 V DC	12 V DC
Storage capacity	158 L	210 L
Operating temperature	4 °C to -10 °C (39.2 °F to 14 °F)	4 °C to -10 °C (39.2 °F to 14 °F)
Power (energy consumption)	N/A	N/A
Power rating	60 W	60 W
Capacity of PV modules required	2 x 180 W	2 x 180 W
Product dimensions	110 cm high x 63.5 cm wide x 84.5 cm deep	85 cm high x 63.5 cm wide x 84.5 cm deep
PAYGO integration capabilities	Yes	Yes

TERMS OF SALE

Cash & carry

PAYGO

PRODUCT SPECS

PRODUCT LINK

KOOLHOME CLASSIC FREEZER/ REFRIGERATOR

The Koolhome Classic model, designed and developed by Koolboks Ltd, offers long term cold-storage through its insulation and ice battery technology. With its adjustable temperature range, the product can function as a refrigerator or freezer. This freezer does not have an in-built lithium battery.

Target use: Food storage

Manufacturer:
Koolboks
Rosny-sous-Bois, France

Distributor(s):
Lib Solar

Distribution channels:
Direct retail

SPECS | Koolhome Classic Freezer/Refrigerator

Product information	BD-158	BD-210	BD-540
Product type	Solar freezer/refrigerator	Solar freezer/refrigerator	Solar freezer/refrigerator
AC/DC coupled	DC	DC	DC
Voltage range	12 V / 24 V DC	12 V / 24 V DC	12 V / 24 V DC
Storage capacity	158 L	210 L	540 L
Operating temperature	4 °C to -10 °C (39.2 °F to 14 °F)	4 °C to -10 °C (39.2 °F to 14 °F)	4 °C to -10 °C (39.2 °F to 14 °F)
Power (energy consumption)	N/A	N/A	N/A
Power rating	60 W	60 W	180 W
Capacity of PV modules required	2 x 180 W	2 x 180 W	6 x 180 W
Product dimensions	85 cm high x 63.5 cm wide x 84.5 cm deep	110 cm high x 63.5 cm wide x 84.5 cm deep	154 cm wide x 67.5 cm high x 84.5 cm deep
PAYGO integration capabilities	Yes	Yes	Yes

TERMS OF SALE

Cash & carry

PRODUCT SPECS

PRODUCT LINK

FELICITY SOLAR 200 L DC SOLAR-POWERED FREEZER

Felicity Solar's solar-powered freezer system includes photovoltaic (PV) panels, a solar controller, and a battery.

Target use: Refrigeration of perishable goods such as meat and dairy; vaccine storage

Manufacturer:
Felicity Solar Private Limited
45 Glenara Avenue South
Eastlea, Harare
Zimbabwe

Distributor(s):
EcoPower Liberia

Distribution channels:
Direct retail

SPECS | 200 L DC Solar-powered Freezer

Product information	200 L DC Solar-powered Freezer
Product type	Solar freezer
AC/DC coupled	DC
Voltage range	12 V
Storage capacity	200 L
Operating temperature	N/A
Power (energy consumption)	N/A
Power rating	N/A
Capacity of PV modules required	2 x 180 W or 2 x 200 W
Product dimensions	N/A
PAYGO integration capabilities	Yes

TERMS OF SALE

Cash & carry

Flexible instalments

PRODUCT SPECS

PRODUCT LINK

SUNDANZER SOLAR DIRECT DRIVE SERIES (BFRV15 AND BFRV55 MODELS)

Pre-qualified by the World Health Organization (WHO), the SunDanzer BFRV15 and BFRV55 can store vaccines by using solar direct-drive battery-free technology. A proprietary phase-change material ensures that the vaccine compartment stays between 2 °C and 8 °C (35.6 °F and 46.4 °F). These units are equipped with thermal storage packs to cool the unit when power is unavailable. One of the features of the SunDanzer direct drive system is an east-west orientation of the solar photovoltaic (PV) modules (available separately). Two 100 W modules face east, and two 100 W modules face west. This orientation ensures maximum compressor run-time.

Target use: Medical refrigeration

Manufacturer:
SunDanzer
420 E Aviation Drive
Suite 130
Arizona 85714
United States
medical@sundanzer.com

Distributor(s):
West Coast Energy

Distribution channels:
Direct retail

Large distributor

SPECS | SunDanzer BFRV55

Product information	BFRV15	BFRV55
Product type	Refrigerator	Refrigerator
AC/DC coupled	DC	DC
Voltage range	12 V DC	12 V DC
Storage capacity	15 L	55 L
Operating temperature	2 °C to 8 °C (35.6 °F to 46.4 °F)	2 °C to 8 °C (35.6 °F to 46.4 °F)
Holdover time	101 h 19 min at 43 °C (109.4 °F)	83 h 29 min at 43 °C (109.4 °F)
Power (energy consumption)	N/A	N/A
Capacity of PV modules required	400 Wp	400 Wp
Product dimensions	68 cm wide x 64 cm high x 78 cm deep	97 cm high x 78 cm wide x 86 cm deep
PAYGO integration capabilities	No	No

TERMS OF SALE

Cash & carry

Flexible instalments

PRODUCT SPECS

PRODUCT LINK

SUNDANZER HYBRID SERIES (DCRV75-KIT AND DCRV20-KIT MODEL)

The Hybrid series of refrigerators meets or exceeds all WHO performance, quality, and safety (PQS) standards for off-grid vaccine storage. However, these products are not listed on the PQS catalog as the WHO does not yet have a category for hybrid units. The Hybrid models combine thermal storage with a long-life lithium iron phosphate battery system (rated for 3,000 full charge cycles) for easy plug-and-play installation. This hybrid design allows for a smaller PV array, more internal volume, faster cooldown, and sufficient low-light performance while meeting or exceeding WHO PQS requirements.

Target use: Medical refrigeration

Manufacturer:
SunDanzer
420 E Aviation Drive
Suite 130
Arizona 85714
United States
medical@sundanzer.com

Distributor(s):
West Coast Energy

Distribution channels:
Direct retail

Large distributor

SPECS | SunDanzer Hybrid Series

Product information	DCRV20-KIT	DCRV75-KIT
Product type	Refrigerator	Refrigerator
AC/DC coupled	DC	DC
Voltage range	12V DC	12V DC
Storage capacity	20 L	75 L
Operating temperature	2 °C to 8 °C (35.6 °F to 46.4 °F)	2 °C to 8 °C (35.6 °F to 46.4 °F)
Holdover time	>100 h at 43 °C (109.4 °F)	>100 h at 43 °C (109.4 °F)
Power (energy consumption)	N/A	N/A
Capacity of PV modules required	N/A	N/A
Product dimensions	68 cm wide x 64 cm high x 78 cm deep	97 cm wide x 78 cm high x 86 cm deep
PAYGO integration capabilities	No	No

TERMS OF SALE

Cash & carry

Flexible instalments

PRODUCT SPECS

PRODUCT LINK

SUNDANZER DIRECT DRIVE ICE PACK FREEZER

SunDanzer's Direct Drive Ice Pack Freezer (DDF50) is a solar-powered direct-drive water pack freezer that connects directly to the solar array and requires no batteries or charge controllers to operate. The unit freezes ice packs which can refrigerate vaccines and is designed to work alongside the BFRV55 or BFRV15 refrigerator. The unit naturally pre-conditions the ice packs each morning. The product produces 2.4 kg (5.2 lb) of ice daily.

Target use: Medical refrigeration

Manufacturer:
SunDanzer
420 E Aviation Drive
Suite 130
Arizona 85714
United States
medical@sundanzer.com

Distributor(s):
West Coast Energy

Distribution channels:
Direct retail

Large distributor

SPECS | SunDanzer Direct Drive Ice Pack Freezer

Product models	
Product type	Ice pack freezer
AC/DC coupled	DC
Voltage range	12 V DC
Storage capacity	30 L
Operating temperature	2 °C to 8 °C (35.6 °F to 46.4 °F)
Holdover time	N/A
Power (energy consumption)	N/A
Capacity of PV modules required	N/A
Product dimensions	77 cm wide x 70.4 cm high x 59.3 cm deep
PAYGO integration capabilities	No

PUMPING SOLUTIONS

Pumping Solutions – List of Featured Products

1. Futurepump SF2 Ⓥ
2. Grundfos CR Flex Series
3. Grundfos SQFlex Series Centrifugal Pumps
4. Grundfos SQFlex Series Helical Pumps Ⓥ
5. Omnivoltaic Solar-powered Pumps Ⓥ
6. Sun Pump SDS-T Series DC Submersible Pumps

Ⓥ = VeraSol-tested/-certified

QUALITY STANDARDS

READ MORE ABOUT PUMPING SOLUTIONS

PUMPING SOLUTIONS

Although solar water pumps vary in size, this catalog focuses on solar pumps with a power rating between 150 watts (W) to 10 kilowatts (kW) (13 horsepower [HP]). Solar pumps are one part of the pumping system that involves three key components: The pumping mechanism itself, the pump controller, and the solar energy-generating technology (i.e., solar panels and inverters).

Pumps are classified as either surface pumps or submersible pumps depending on the depth of their submersion in a water source. **Surface pumps** are designed to pump water from surface sources, such as rivers, ponds, and shallow wells. They are placed above the surface of the water and should not be submerged. They are designed to draw water to a maximum depth of eight meters, beyond which submersible pumps are used. **Submersible pumps** are fully submerged in water and include a hermetically sealed motor which is close-coupled to the body of the pump.

Direct current (DC) pumps draw power directly from solar panels without inverting.

Alternating current (AC) pumps require an inverter to transform the DC power from the panels into AC power. Both types of solar pumps require an electronic-pump controller. One of the key features of the controller, the Linear Current Booster (LCB), boosts the current from the solar array by lowering the voltage, which translates the current and voltage available from the PV panels into a combination that better serves the pump's power requirements. The LCB enables pumps to operate even in the low-light conditions of early mornings, late evenings, and cloudy days. A pump's control box also protects it from current and voltage spikes and enables its sensors, such as the float switch, to activate and deactivate the pump. Some controllers also have remote monitoring capabilities.

PUMPING SOLUTIONS

DC pumps can operate without a controller while connected to a battery system. External power-storage systems, such as batteries, allow pumping to occur at night and in low-light conditions. Such storage systems allow pressure boosting to provide a continuous water supply at any time for optimal output. Most solar water-pumping systems, however, do not have energy storage and, therefore, can operate only within daylight hours.

Pump sizing

The process of selecting the best pump system for a specific purpose involves several steps, the first of which is sizing. During the sizing process, a user must evaluate several parameters, such as flow rate and total dynamic head. Sizing is a technical process that requires qualified personnel and technicians to obtain an accurate fit.

Various online resources are available to assist in determining the correct pump for a particular application, including pump-sizing resources on the websites of many manufacturers. Some manufacturers also sell complete plug-and-play solar systems, as featured in this catalog, which come equipped with solar panels, pump controllers, and solar pumps. In most cases, because companies sell pumps as singular units, users must complete the sizing process.

Special considerations

Because it is essential to seek the advice of qualified technical experts to achieve correct sizing, this catalog does not delve into the technical details of pump sizing.

PUMPING SOLUTIONS

However, in general, the sizing process involves the following steps:

	Objective	Considerations
Step 1	Determine if a surface or submersible pump is suitable for a particular application	What is the source of water, river, water pan, shallow well, borehole?
Step 2	Determine the daily water requirement	How many liters is the pump required to move during the day within prime daylight hours?
Step 3	Determine if the water source can produce enough water to supply the pump system	For example, the required water amount may be 100 liters per hour (L/h); however, the water source may supply only 50 liters per hour. For boreholes, wells, or streams, if flowrates are unknown, end-users can conduct test-pumping
Step 4	Determine the total dynamic head	How high does the pump need to move the water? Measurements must account for the margin of friction loss
Step 5	Determine the correct pump make and model by referring to the pump flow chart, provided by the manufacturer	N/A
Step 6	Estimate the balance of the system	This includes the wiring, piping, and necessary fittings

PUMPING SOLUTIONS

Pump controllers

The primary function of the controller is to boost the current of solar modules in low-light conditions while holding the voltage of the solar modules at the maximum power point (i.e., the point of highest power output). This allows a pump to start earlier in the morning and stay running late into the evening.

A variety of controllers meet the specific needs of individual pumps, allowing them to maximize their output. DC pump controllers, also known as converters, maximize both the DC current and voltage. AC pump controllers invert the DC current to AC for use by the AC motors. It is also possible to use a solar-pump inverter to convert a grid-powered AC pump to use solar panels without changing the AC pump.

Related Resources

For calculation sheets, checklists and guidelines, see the Toolbox on Solar Powered Irrigation Systems by the Water and Energy for Food (WE4F) program.

TERMS OF SALE

Cash & carry

PRODUCT SPECS

PRODUCT LINK

FUTUREPUMP SF2

A portable reciprocating piston water pump suitable for smallholders' irrigation needs.

Target use: Irrigation by smallholder farmers

Manufacturer:
Futurepump Limited
support@futurepump.com

Distributor(s):
EcoPower Liberia

Distribution channels:
Direct retail

SPECS | Futurepump SF2

Product models	
Product type	Surface-mounted water pump
Pump type	Piston
Power rating	80–120 W
Required solar panel size	120 W
AC/DC coupled	DC
Voltage range	60 V DC
Total dynamic head	15 m
Max discharge rate	3.6 m^3/h
PAYGO integration capabilities	No

TERMS OF SALE

Cash & carry

Flexible instalments

PRODUCT SPECS

PRODUCT LINK

GRUNDFOS CR FLEX SERIES

The solar-powered Grundfos CR Flex is a multi-stage centrifugal in-line non-self-priming surface pump designed for water transfer, irrigation, and pressure-boosting. It is fitted with the MG Flex permanent magnet variable frequency–driven motor.

Target use: Small-scale irrigation, fish farming, and water supply (e.g., for livestock)

Manufacturer:
Grundfos
Poul Due Jensens Vej 7
Dk-8850 Bjerringbro
Denmark

Distributor(s):
West Coast Energy

Distribution channels:
Direct retail
Large distributors

SPECS | Grundfos CR Flex Series

Product models	
Product type	Surface-mounted water pump
Pump type	Centrifugal
Load	1,730 W
AC/DC coupled	DC
Voltage range	30–300 V DC; 90–240 V AC 50/60 Hz
Total dynamic head	150 m
Max discharge rate	13 m^3/h
Controller requirements	Required
PAYGO integration capabilities	No

TERMS OF SALE

Cash & carry

Flexible instalments

PRODUCT SPECS

PRODUCT LINK

GRUNDFOS SQFLEX SERIES CENTRIFUGAL PUMPS

SQFlex is a water-supply system powered by renewable energy from solar and wind. Thanks to its flexible energy supply and performance, the SQFlex system can be adapted to a range of uses and locations. The SQFlex system has a wide voltage range, built-in maximum power-point tracking (MPPT), as well as dry-running, voltage, and overload protection. The SQFlex series of pumps comprises 11 pump sizes: Five helical rotor pumps for medium-to-high heads and low-to-medium flows; and six centrifugal pumps for shallow heads and high flows.

Target use: Medium-to-high heads and low-to-medium flows; centrifugal pumps for shallow heads and high flows

Manufacturer:
Grundfos
Poul Due Jensens Vej 7
Dk-8850 Bjerringbro
Denmark

Distributor(s):
West Coast Energy

Distribution channels:
Direct retail

Large distributor

SPECS | Grundfos SQ Flex Series Centrifugal Pumps

Product models	
Product type	Surface-mounted water pump
Pump type	Centrifugal
Load	1,730 W
AC/DC coupled	DC
Voltage range	30–300 V DC; 90–240 V AC 50/60 Hz
Total dynamic head	150 m
Max discharge rate	13 m^3/h
Controller requirements	Controller required
PAYGO integration capabilities	No

TERMS OF SALE

Cash & carry

Flexible instalments

PRODUCT SPECS

PRODUCT LINK

GRUNDFOS SQFLEX SERIES HELICAL PUMPS

The SQFlex system is a water-supply system powered by renewable energy from solar and wind. Thanks to its flexible energy supply and performance, the SQFlex system can be adapted to a range of uses and locations. The SQFlex system has a wide voltage range, built-in maximum power-point tracking (MPPT), as well as dry-running, voltage, and overload protection. The SQFlex series of pumps comprises 11 pump sizes: Five helical rotor pumps for medium-to-high heads and low-to-medium flows; and six centrifugal pumps for shallow heads and high flows.

Target use: High head, low-to-medium-flow applications

Manufacturer:
Grundfos
Poul Due Jensens Vej 7
Dk-8850 Bjerringbro
Denmark

Distributor(s):
West Coast Energy

Distribution channels:
Direct retail

Large distributor

SPECS | Grundfos SQ Flex Series Helical Pumps

Product information	
Product type	Submersible water pump
Pump type	Helical
Power rating	1,000–4,000 W
AC/DC coupled	AC and DC coupled
Voltage range	30–300 V DC and 90–240 V AC
Total dynamic head	250 m
Max discharge rate	2.8 m^3/h
Controller requirements	External controller required
PAYGO integration capabilities	No

TERMS OF SALE

Cash & carry

PRODUCT SPECS

PRODUCT LINK

OMNIVOLTAIC SOLAR-POWERED PUMPS

Omnivoltaic's solar-powered water pumps are submersible.

Target use: Medium to high head; medium flow applications

Manufacturer:
Omnivoltaic Energy Solutions (Kenya) Co., Ltd.
No. 12, Masaba Road, Upper Hill, Nairobi, Kenya

Distributor(s):
EcoPower Liberia

Distribution channels:
Direct retail

SPECS | Omnivoltaic Solar Pumps

Product information	3PSP1.8-10	3PSP2.5-10	3PS3.5-19	4PSP8-7
Product type	Submersible			
Pump type	Centrifugal			
Power rating	370 W	550 W	1,500 W	1,500 W
Required solar panel size	800 W	1,600 W	3,200 W	3,200 W
AC/DC coupled	DC			
Voltage range	48 V DC	48 V DC	96 V DC	96 V DC
Total dynamic head	19 m	32 m	57 m	35 m
Max discharge rate	1.8 m^3/h	2.4 m^3/h	3.5 m^3/h	7.2 m3/h
Controller requirements	External controller			
PAYGO integration capabilities	Yes			

TERMS OF SALE

Cash & carry

Flexible instalments

PRODUCT SPECS

PRODUCT LINK

SUN PUMP SDS-T SERIES DC SUBMERSIBLE PUMPS

Sun Pump's SDS-T series pumps are positive-displacement solar-powered submersible pumps. Constructed out of Ryton and stainless steel, these pumps are durable and corrosion-resistant. They operate on 12 to 30 V DC, which may be supplied from a variety of sources, including solar panels and batteries.

Target use: Off-grid homes, campsites, and smallholder farms

Manufacturer:
Sun Pumps USA
325 E Main Street
Safford, Arizona, 85546
+1 928 348 9652

Distributor(s):
West Coast Energy

Distribution channels:
Direct retail

Large distributors

SPECS | Sun Pumps SDS-T Series DC Submersible Pumps

Product information	
Product type	Submersible pump
Pump type	Diaphragm submersible pumps
Max load power	126 W
AC/DC coupled	DC
Voltage range	12–30 V DC
Total dynamic head	70 m
Max discharge rate	0.637 m^3/h
PAYGO integration capabilities	No